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Enbridge Line 6B Mile Post 608 Pipeline Release
Marshall Michigan
Downstream Impacted Areas
Response Completion Report

September 27, 2010

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Downstream Impacted Area
Response Completion Reports

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List of Acronyms/Definitions

EAG – Environmental Advisory Group

USEPA – U.S. Environmental Protection Agency

FWS – U.S. Fish and Wildlife Service

HSP – Health and Safety Plan

MDNRE – Michigan Department of Natural Resources and Environment

NOAA – National Oceanic and Atmospheric Administration

NRC- National Response Center

NREPA – Natural Resources and Environmental Protection Act

Oil Saturated Soil – Soils containing free-phase product capable of flowing or migrating as oil and/or sheen, either of which is affecting or threatens to affect navigable waterways.

ORCP - Oil Recovery and Containment Plan

PRWP – Pipeline Repair Work Plan

QAPP – Quality Assurance Project Plan

RAO – Removal Administrative Order

Response – The initial response to remove oil affected-media and/or sheen affecting and/or posing a risk to navigable water bodies

RPDIA – Response Plan for Downstream Impacted Areas

SAP – Sampling and Analysis Plan

SCAT – Shoreline Cleanup Assessment Technique

Source Area - The primary location impacted by the crude oil release

SAR – Source Area Response Plan - A work plan describing interim response actions designed to protect navigable waters from the crude oil release

SARC – Source Area Response Completion Report

WTTDP – Waste Treatment, Transportation, and Disposal Plan

1.0 INTRODUCTION

This Downstream Impacted Areas Response Completion Report summarizes response actions conducted and reported in supporting documentation to the Enbridge Energy, Limited Partnership's Line 6B Mile Post (MP) 608 crude oil release into the Kalamazoo River in Marshall, Michigan on July 26, 2010. Specifically, this report introduces the project and background information in Section 1.0, describes the methodology used to assess river segment oiling conditions and cleanup needs in Section 2.0, presents the methodologies recommended for cleanup in Section 3.0, and outlines a 5-step work flow devised by Enbridge to achieve cleanup endpoints in Section 4.0 and a conclusion in Section 5.0. References cited in this report are listed after the text in Section 6.

1.1 Overview

The purpose of this Downstream Impacted Areas Response Completion Report is to provide a summary of the response actions conducted and the results of the supporting documentation. The areas impacted by the oil release described in this report herein are referred to as the Downstream Impacted Areas. The response actions were conducted in accordance with the U.S. Environmental Protection Agency (USEPA) approved Response Plan for the Downstream Impacted Areas (RPDIA) dated August 2, 2010 and revised August 17, 2010, in accordance with the USEPA comments (Enbridge 2010a). The RPDIA was prepared in response to the USEPA Removal Administrative Order (RAO) dated July 27, 2010 including Section V, Subsection 18, Bullet Point 7, and provides a description of interim remedial activities required to address cleanup of Downstream Impacted Areas. Based on the results and documentation provided in this report, Enbridge has met the objectives of the RPDIA and requests USEPA's concurrence.

1.2 Site Release History and Boundaries

On July 26, 2010, a release of heavy crude oil from Enbridge's 30-inch pipeline, referred to as "Line 6B", was discovered. According to the National Response Center (NRC) report, approximately 19,500 barrels of crude oil was released from a location in the pipeline just west of pipeline mile post 608 in Marshall, Calhoun County, Michigan. The geographic coordinates of the approximate area of the release are 42.2395273° West Latitude and -84.9662018° North

Longitude in an undeveloped area, south of Marshall, Michigan. The site location is shown in Figure 1, Site location Map (U. S. Geological Survey [USGS]).

The release entered Talmadge Creek through an adjacent wetland and traveled downstream to the Kalamazoo River, both navigable water bodies. The two main areas that were impacted by the release are designated as the "Source Area" and the "Downstream Impacted Areas" and are shown on Figure 2 Site Layout Map (National Agriculture Imagery Program, 2009).

The Source Area is a lowland area with marshy terrain located approximately 0.4 mile west of US-227 (17 Mile Road), and approximately 0.2 mile south of Division Drive. Talmadge Creek and all affected navigable waterways up to the confluence of the Kalamazoo River, including shorelines and adjacent areas, comprise the Source Area.

The Downstream Impacted Area is located downstream of the Source Area and consists of Division C (between MP 2.25 – 17.25), Division D (between MP 17.50-24.0), and Division E (between MP 24.25 -40) (Figure 2 Site Layout Map). Specifically, this area includes approximately 40 miles of the Kalamazoo River, including all affected navigable waterways, their shorelines and adjacent affected areas from the confluence with Talmadge Creek down to the Morrow Lake Dam. The Downstream Impacted Area of the Kalamazoo River is bordered by marshland, residential properties, farmland and commercial properties. The Kalamazoo River experienced flooding prior to, during and after the release. Once river levels had fallen, some overbank areas contained stranded oil, along with oil-stained vegetation and debris. Upon notification of the release, containment booms were deployed on the Kalamazoo River and Morrow Lake to minimize impacts and collect the released oil. Boom, skimming equipment, vacuum trucks and other equipment were used in oil collection and removal along both Talmadge Creek and the Kalamazoo River.

This Response Completion Report addresses the in-river areas, the shoreline and the overbank areas impacted by the release. In addition, impacted wetlands, floodplain areas and marshes (within the Downstream Impacted Areas) are also addressed in accordance with recommendations made for each individual 0.25-mile river segment by the Shoreline Cleanup

Assessment Technique (SCAT) Team. Separate reports address the completion of response activities in the Source Area.

In conjunction with the August 17, 2010 RPDIA, the following documents were requested by the RAO and were prepared, submitted to, and approved by the USEPA as separate documents:

- Site Health and Safety Plan (HASP)
- Pipeline Repair Work Plan (PRWP)
- Sampling and Analysis Plan (SAP)
- Quality Assurance Project Plan (QAPP)
- Oil Recovery and Containment Plan (ORCP)
- Source Area Response (SAR) Plan
- Waste Treatment, Transportation, and Disposal Plan (WTTDP)

1.3 Objectives and Metrics of the Response Plan for Downstream Impacted Areas

This report documents the methodologies and workflow used to achieve cleanup objectives, endpoints, and metrics for the areas of the Kalamazoo River downstream from the confluence with Talmadge Creek. These cleanup objectives were initially outlined in Part 8 of the RPDIA. The Oil Recovery Reports included in Appendix I of this document, provide a record of initial oiling conditions, cleanup operations conducted and cleanup outcomes for individual 0.25-mile segments of the Kalamazoo River.

Approximately 38 miles of the Kalamazoo River were divided into 152 separate 0.25-mile segments for the purpose of oiling assessment and cleanup tracking. Segment boundaries were labeled with "Mile Posts" (MP) defined in reference to miles downstream from the Source Area. The downstream river mile post was used in the naming convention to designate each river segment (for example, segment 3.5 refers to the river segment extending from MP 3.25 to 3.5).

The downstream impacted area was divided as follows:

- **Division C**: From the confluence of Talmadge Creek and the Kalamazoo River to the Angell Street Bridge, divided into the following groups:
  - Group 1 (MP 2.25 through 6.0)
  - Group 2 (MP 6.25 through 10.0)
  - Group 3 (MP 10.0 through 12.0)
  - Group 4 (MP 12.25 through 17.25)
- **Division D**: Angell Street Bridge to the Calhoun / Kalamazoo County line.
- **Division E**: Calhoun / Kalamazoo County line to Morrow Lake Dam.

Within Division C, the Kalamazoo River was subdivided into four groups based on river mile posts; Group 1, Group 2, Group 3, and Group 4. Group 1 of Division C is defined as the river segments from confluence of Talmadge Creek and the Kalamazoo River downstream to Ceresco Dam. Several areas of interest were identified within Group 1 that required additional maintenance to uphold the cleanup efforts. Several islands within Group 1 continued to produce sheen despite appropriate cleanup efforts. To mitigate impacts of the remaining sheen to the river system, Enbridge utilized hard boom around the islands to minimize sheen drift while additional cleanup work was completed. A second area of interest within Group 1 included a pool of free oil that was contained within submerged aquatic vegetation located directly upstream of Ceresco Dam. The large amounts of submerged aquatic vegetation containing oil prolonged the cleanup efforts in this portion of Group 1. Enbridge deployed mechanical aquatic vegetation removal devices to capture and remove this free oil from the area near Ceresco Dam.

Group 2 of Division C is defined as the river segments from the downstream side of Ceresco Dam downstream to approximately the Historic Park Bridge area. The initial portion of Group 2 includes a well-defined channel that runs approximately from Ceresco Dam or mile post 6.25 to mile post 6.5. After approximately mile post 7.0, the Kalamazoo River enters an area where the channel became less defined and the floodplain extends broadly on both the left and right descending banks. Because of the extended floodplain, additional cleanup operations were required to complete overbank cleanup.

Group 3 of Division C is defined from the Historic Bridge Park area to Raymond Road. Group 3 included an area where the most intensive overbank / floodplain cleanup operations occurred. Two sections of river within Group 3 required the greatest effort to meet operational endpoints; MP 11.0 to 11.5 on the right descending bank and MP 11.0 to 12.25 on the left descending bank. MP 11.0 to 11.5 right descending bank section required helicopter operations to remove oil-saturated soil in emergent and forest wetland within the segment. The 11.0 to 12.25 left descending bank section required mechanical means to remove the oil-saturated soil to attain operational cleanup endpoints in each segment.

Group 4 of Division C is defined from Raymond Road to the downstream side of the confluence of the Kalamazoo River and Battle Creek. Several areas of interest within Group 4 which required additional maintenance to attain the operational endpoints were identified. One area in particular, was a section of river within the City of Battle Creek where the Kalamazoo River is channelized with concrete and riprap for flood control. The major concerns in the channelized river were regarding using power washing of riprap banks as a cleanup method. Enbridge and response agencies noted that historical contamination in the soils beneath the riprap could be released with power washing, and further contaminate the Kalamazoo River. The City of Battle Creek and Enbridge conjointly prepared a document titled "Enbridge Oil Spill Cleanup Procedure for the Riprap Section of the Flood Control Project within the Kalamazoo River" (Appendix II) that addresses these concerns.

Within Division D, defined as the confluence of the Kalamazoo River and Battle Creek to MP 24, a more defined channel and less overbank and floodplain areas. The initial oil release impacted Division D with lighter levels of shoreline oiling and limited overbank impacts. Cleanup operations in Division D were able to meet the cleanup endpoints with no additional maintenance activities.

Division E, defined as MP 24.25 to the downstream side of Morrow Lake, contained sporadic light oiling along the shoreline and overbank. Division E required the least effort in cleanup operation activities. Cleanup operations in Division E were able to meet the cleanup endpoints with no additional maintenance activities.

The RPDIA cleanup objective was to remove and/or abate visible oil and sheen that is either currently affecting and/or poses a threat of release of visible oil or sheen discharge to the navigable waterway. Metrics of successful cleanup for a river segment vary depending on bank or habitat type and degree of oiling and are defined in the RPDIA as follows:

- Riparian Zones and Stream Banks
  - Shorelines no longer release sheens that affect navigable waterways;
  - Oil no longer removes readily on contact;
  - Oil removal to the point where recovery/re-colonization can occur without causing more harm than leaving the oil in place;
- Soil, Sand and Gravel
  - Oil no longer visible on surface;
- Man-Made Structures
  - Structure no longer generates liquid oil or sheen;
  - Oil no longer removes readily on contact.

These metrics were assessed by visual field screening for the presence of materials capable of producing a release of oil or oil sheen. Visual screening does not include additional screening tests, such as organic headspace (using a photo-ionization detector [PID]) or detecting a petroleum odor. Any residual impacts will be addressed as part of a long-term assessment and remediation effort for the site and are not addressed in this document.

2.0 SHORELINE CLEANUP ASSESSMENT TECHNIQUE (SCAT)

Shoreline Cleanup Assessment Technique (SCAT) teams, consisting of representatives from USEPA, Michigan Department of Natural Resources and Environment (MDNRE), and Enbridge, were formed to assess and document shoreline oiling and recommend cleanup methods following accepted shoreline assessment procedures (National Oceanic and Atmospheric Administration [NOAA] 2000). NOAA devised the SCAT survey system for rapid assessment of oil impact to shoreline habitats in a marine setting. While the survey technique remains the same for the Kalamazoo River, the cleanup methodologies recommended by SCAT teams have been adapted to freshwater, riverine environments (NOAA 2000; Kalamazoo River Enbridge Pipeline Release Environmental Science Group 2010).

SCAT surveys identified and estimated the areas of zones (labeled alphabetically) of specific oiling and substrate conditions within each 0.25-mile segment of river along the Downstream Impacted Areas, as seen in the specific example shown on Figure 3 (Mile Post 3.0 SCAT Recommendation Map). Oiling conditions and substrate types were characterized using a standardized terminology, Shoreline Oil Terminology / Codes for Oil Spills of Black Oil included in Appendix III. Percent cover of a specific oiling condition within a SCAT zone is recorded on SCAT field maps and forms. SCAT teams were directed to collect a waypoint, using a handheld recreational-grade global positioning system (GPS) unit, for each of the oiled zones identified as needing a cleanup action. Cleanup recommendations are provided based on the habitat or feature in which the oiling occurred as well as the degree of oiling observed (see section 3.0 for discussion of cleanup methodologies).

SCAT teams assessed the Kalamazoo River from the confluence of Talmadge Creek (Division C) downstream through the west side of Morrow Lake (Division E). The SCAT surveys included the river shoreline (defined as areas from the water's edge to 10 feet from the water's edge) and overbank areas (areas outside the shoreline including floodplain forest, grasses and wetlands). Islands observed within the river system were also assessed. All surveys were conducted by boat and/or foot and targeted shoreline and accessible overbank areas. Shorelines were identified in the cleanup reports as "Left Bank While Facing Downstream", or "Right Bank While Facing Downstream".

Three SCAT surveys were conducted along the Downstream Impacted Areas during three different timeframes:

- August 2 -10, 2010; shoreline assessment only (no overbank); Entrix (Enbridge contractor) management.
- August 15 - 21, 2010; shoreline assessment and "Hot-Spot" overbank assessment as directed by USEPA lead; USEPA management.
- August 20 - September 4, 2010; shoreline and overbank assessments; Entrix (Enbridge contractor) management.

From August 2 , 2010 through August10, 2010, assessments were conducted during the initial spill response, as a joint Response and Natural Resource Damage Assessment (NRDA) effort.

These surveys were conducted by two SCAT teams, each consisting of representatives from USEPA, NOAA, United State Fish and Wildlife Service (FWS), MDNRE and Enbridge. These surveys assessed the shoreline of Talmadge Creek and the Kalamazoo River. No overbank areas were surveyed, though the teams provided recommendations for revisiting areas for potential overbank oiling. During these surveys, SCAT teams recorded findings on hard copy field forms. This data was then manually input into an USEPA-based software application. Cleanup recommendations made were based on established USEPA guidelines. Entrix (Enbridge sub-contractor) staff coordinated surveys and data management for this time frame.

From August 15, 2010 through August 21, 2010 USEPA surveys were coordinated by USEPA. These surveys were conducted by two teams consisting of three members; one representative each from USEPA, MDNRE, and Enbridge. NOAA and USFWS personnel did not participate in these surveys. These surveys assessments included the Downstream Impact Area shorelines, overbank areas, and islands in Division C. Hard copy field forms were used to collect field survey data. The data from these surveys was also manually input into the USEPA-based software application through August 19, 2010. Compilation of SCAT survey result packages were delayed during these surveys because of variations in data collection methods and formats.

August 20, 2010, through September 4, 2010, surveys, managed by Entrix (Enbridge Contractor), were conducted by two SCAT teams consisting of three members (USEPA, MDNRE, and Enbridge). These assessments included the Downstream Impact Area shorelines, overbank areas, and islands in Divisions C, D, and E. Overbank areas were assessed to a distance away from the river at which no evidence of primary or secondary hydraulic indicators or floodplain characteristics were observed. These surveys did not include the overbank areas of river segments MP 6.25 through 10, with the exception of segment 8.5 (USEPA Superfund Technical Assessment & Response Team Contractor completed this section). USEPA staff guided working hours on the water during this timeframe. In an effort to expedite the response and cleanup efforts, two additional SCAT teams were assembled and trained on August 24, 2010. Beginning August 25, 2010, four three-member SCAT teams were utilized; again each team consisted of representatives from USEPA, MDNRE and Enbridge. August 25, 2010 marked the first assessments to collect field data using digital tablets with a software application

developed and managed by Burns and McDonnell (Enbridge contractor). During this time, limited hard copy field forms were utilized to collect survey data (i.e., field sketches were hand drawn on field sketch maps; while field data was captured digitally). By September 1, 2010, six teams were utilized for SCAT assessments. By September 4, 2010, initial SCAT assessments were complete. During these surveys, SCAT teams provided cleanup recommendations based on the Kalamazoo River/Enbridge Pipeline Release- Cleanup Recommendations Methods (Appendix IV). See Figure 4 for overlay data from SCAT surveys, NRDA Floodplain surveys, USEPA START overbank surveys and the current 7 foot inundation / 25-year floodplain data.

3.0 CLEANUP METHODOLOGIES

SCAT assessment teams documenting contamination found the Downstream Impacted Areas to be adversely impacted by crude oil and provided recommendations on the implementation of one or more cleanup methods. Recommended shoreline cleanup procedures were based on NOAA's "Inland Oil Spills, Options for Minimizing Environmental Impacts of Freshwater Spill Response" (NOAA 2000). Trials of three potential cleanup strategies (in-situ thermal destruction, soil scraping, and cold water flushing) were conducted on-site by the USEPA on August 13, 2010. While not conclusive, the trials determined in-situ thermal techniques and soil scraping to be generally ineffective for the Kalamazoo River cleanup. Cold water flushing was effective in removing oil, but resulted in disaggregation of some of the tested substrates. This testing, alongside the work of the Environmental Advisory Group (EAG) (comprised of members of USEPA, NOAA, MDNRE, Kalamazoo River Council, City of Battle Creek, City of Marshall, and Calhoun County Health Department) resulted in the habitat specific cleanup recommendations presented by the USEPA on August 21, 2010. The final iteration of these recommendations is shown in the Kalamazoo River/Enbridge Spill – Cleanup Recommendation Methods (Appendix IV). As is shown, methods vary depending on the habitat type or feature (i.e., man-made structures). The methods presented were intended to facilitate positive habitat response and recovery while minimizing the additional adverse impacts to the environment from response efforts. Recommended methods include removal of pooled oil through manual and absorption techniques, natural attenuation, debris removal, vegetation removal and bagging, high pressure cold water washes and low pressure / high volume cold water washes. Prior to

implementation of more invasive techniques, a work plan was developed for concurrence with USEPA and MDNRE.

See Appendix V for photographs of cleanup methods being implemented on differing habitat types listed in the Kalamazoo River/Enbridge Spill – Cleanup Recommendation Methods.

4.0 THE 5-STEP SEGMENT COMPLETION PROCESS

A 5-step work flow and approval process, used to guide each river segment from the initial stages of assessment to final sign-off acknowledging attainment of the cleanup endpoints as defined in the RPDIA, was developed by Enbridge in cooperation with USEPA and MDNRE staff. Individual river segment completion reports documenting each segment's progress through the 5-step process are attached electronically on a CD, in Appendix I of this report. Each step of the 5-step process is outlined below:

Step 1: SCAT Segment Conditions Assessment

SCAT survey teams examined each 0.25-mile segment of the river to characterize shoreline and overbank habitat types and the degree and characteristics of oiling conditions (see Section 2.0 above). Observations were captured on field forms or in digital tablets, as well as on hand-drawn field sketches. The SCAT assessment data was then provided as a deliverable document for Enbridge cleanup operation crews to use as a guidance document for Step 2 (see below). The SCAT deliverable document provided aerial maps with levels of shoreline oiling and GPS points collected by the SCAT teams, a table describing the SCAT waypoints and cleanup recommendations, and field sketches showing the area of the SCAT waypoints. See Appendix I of this report, and Appendix A of each individual Oil Recovery Report for specific examples.

Step 2: Operations Cleanup and Initial Inspection

Following the SCAT assessments, cleanup operations of oiled areas were then conducted by Enbridge contractors based on the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods (when applicable). See Appendix VI for examples of photographic before and after documentation of differing habitats along the Kalamazoo River. Following completion of cleanup operations, Enbridge Operational Inspectors (OIs) completed inspections for compliance of cleanup with SCAT team recommendations. An Operations Inspection Report (OIR) was

generated to document this step. See Appendix I of this report and Appendix B of each individual Oil Recovery Report for specific examples.

Following Enbridge OI approval, segment results were then re-inspected by an Enbridge Environmental Inspector (EIs). This inspection was summarized in Segment Inspection Reports (SIR). See Appendix B of individual Oil Recovery Reports in Appendix I of this report for specific examples.

Step 3: Site Inspection Sign Off

Following the cleanup operations/EI approval, the segment was then reviewed and given a signatory approval by Enbridge and USEPA representatives. This step did not generate a separate signature document; only the Step 3 signatures shown on the Enbridge Spill SCAT Sign-Off Sheet (see Step 5 below).

Step 4: SCAT Reassessment

Following the Enbridge/USEPA inspection sign-off, a SCAT reassessment team, comprised of USEPA, MDNRE, and Enbridge representatives, revisited the segment and performed a post cleanup SCAT survey. The field form submitted from this re-assessment survey is shown in Appendix C of the individual Oil Recovery Reports within Appendix I of this report.

Step 5: USEPA Sign-Off Sheet

The site status and progress through the 5-Step Cleanup Approval Process is shown in Appendix D of the individual Oil Recovery Reports within Appendix I of this report. As the metrics outlined in the RPDIA are shown to have been met by the applicable signatories in Steps 1 through 4, Enbridge regards the cleanup of the river segment complete.

5.0 CONCLUSION

Based on the results and documentation provided in this report and the following individual Oil Recovery Reports provided electronically in Appendix I, Enbridge has met the objectives of the RPDIA and request USEPA's concurrence.

6.0 REFERENCES

Enbridge Energy. 2010a. "Response Plan for Downstream Impacted Areas." July. Revised August 2010.

Enbridge Energy. 2010b. "Enbridge Pipeline Release Work Plan." August.

Environmental Advisory Group. 2010. "Kalamazoo River / Enbridge Pipeline Release Cleanup Recommendation Methods" August. Revised September 14.

National Agriculture Imagery Program. Flown 2009.

National Oceanic and Atmospheric Administration (NOAA). 2000. "Shoreline Assessment Manual." August.

USGS 7.5- Minute Series Topographic Quadrangle Maps.

Figures

Approximate Site Boundary

Michigan

Figure 1
Location Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

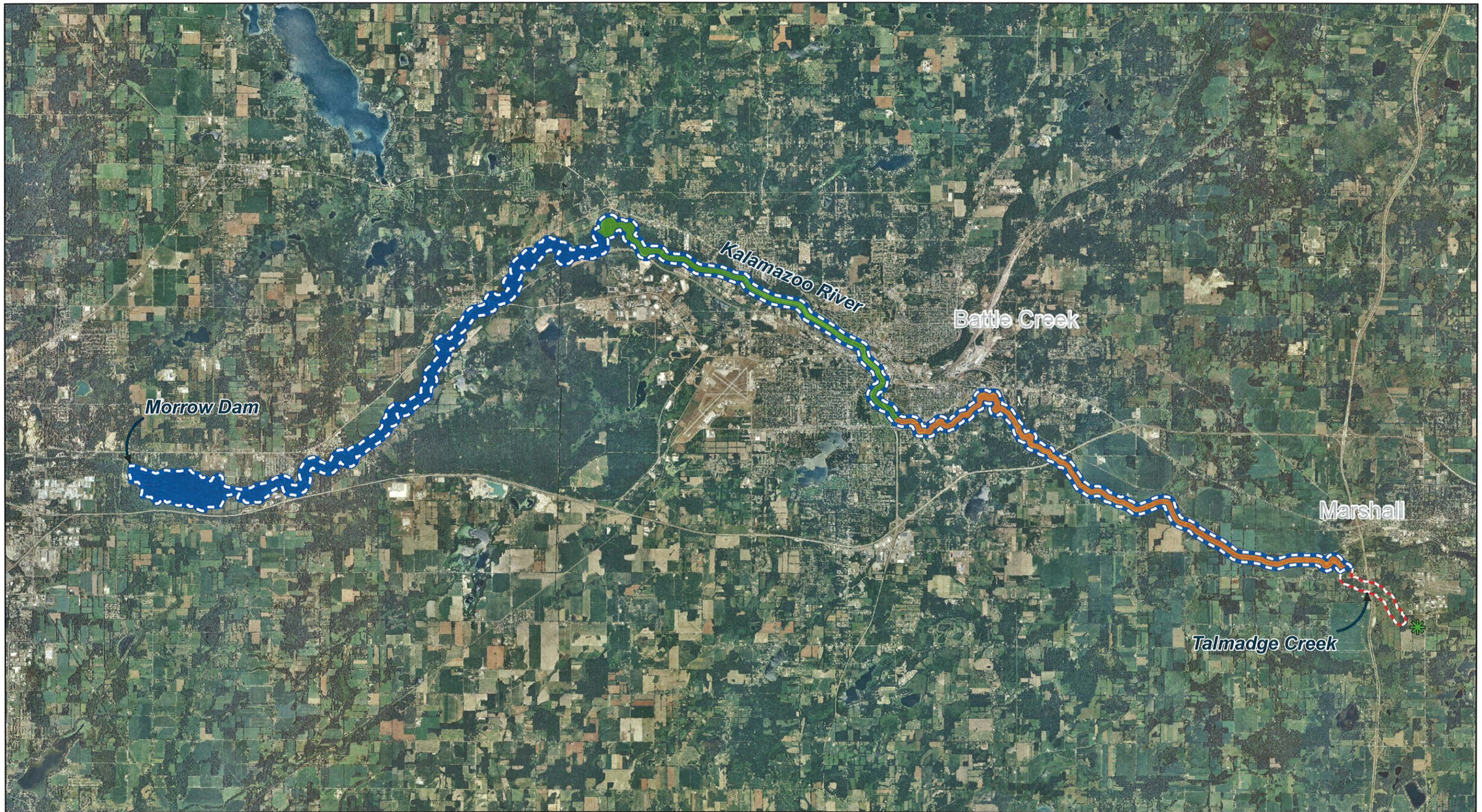
0 12,500 25,000 Feet

Source: Modified from USGS 7.5-Minute Topographic Quadrangles

Figure 1

ENBRIDGE

Coordinate System: NAD 1983 State Plane Michigan South Feet



Michigan

Legend

- Approximate Release Area
- Division C
- Division D
- Division E
- Source Area
- Downstream Impacted Area

Figure 2
Site Layout Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 5,000 10,000 Feet

National Agriculture Imagery Program (NAIP)
Aerial Photography Flown in 2009

Figure 2

ENBRIDGE

Coordinate System: NAD 1983 State Plane Michigan South Feet

Coated vegetation and trees

Stained and coated overhanging vegetation, surface residue 100'x3', 1% distribution

Stained and coated vegetation, surface residue 40'x3', 15% distribution

Stained rip-rap, surface residue 5% distribution

Stained and coated vegetation, tar and film are present, oiled debris 100'x10', 60% distribution

Stained/coated shoreline, film and surface residue, coated vegetation and biological sheen 400'x10', 45% distribution

Inlet creek is stained with coated vegetation, surface residue 3'x50', 45% distribution

Stained and coated grass area, pooled oil, surface residue and matted vegetation 85'x5', 50% distribution

EPA-C-0367 SCC1-8 EPA-C-0366 EPA-C-0365 SCC1-25 EPA-C-0267 SCC1-7 SCC1-6 EPA-C-0364 EPA-C-0254 EPA-C-0258 SCC1-26 EPA-C-0207 EPA-C-0398 EPA-C-0243 EPA-C-0210 EPA-C-0401 SCC1-27 SCC1-4 SCC1-5

ZONE ZONE NO OIL 3 2.75 G A H G F E D B C A C B

Michigan

Legend

Operational Focus Area
Pooled Oil
River Quarter Miles

Shoreline Oiling Category

No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

A B B/C C D E F G H NO OIL ZONE

Figure 3
Mile Post 3.0 SCAT Recommendation Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

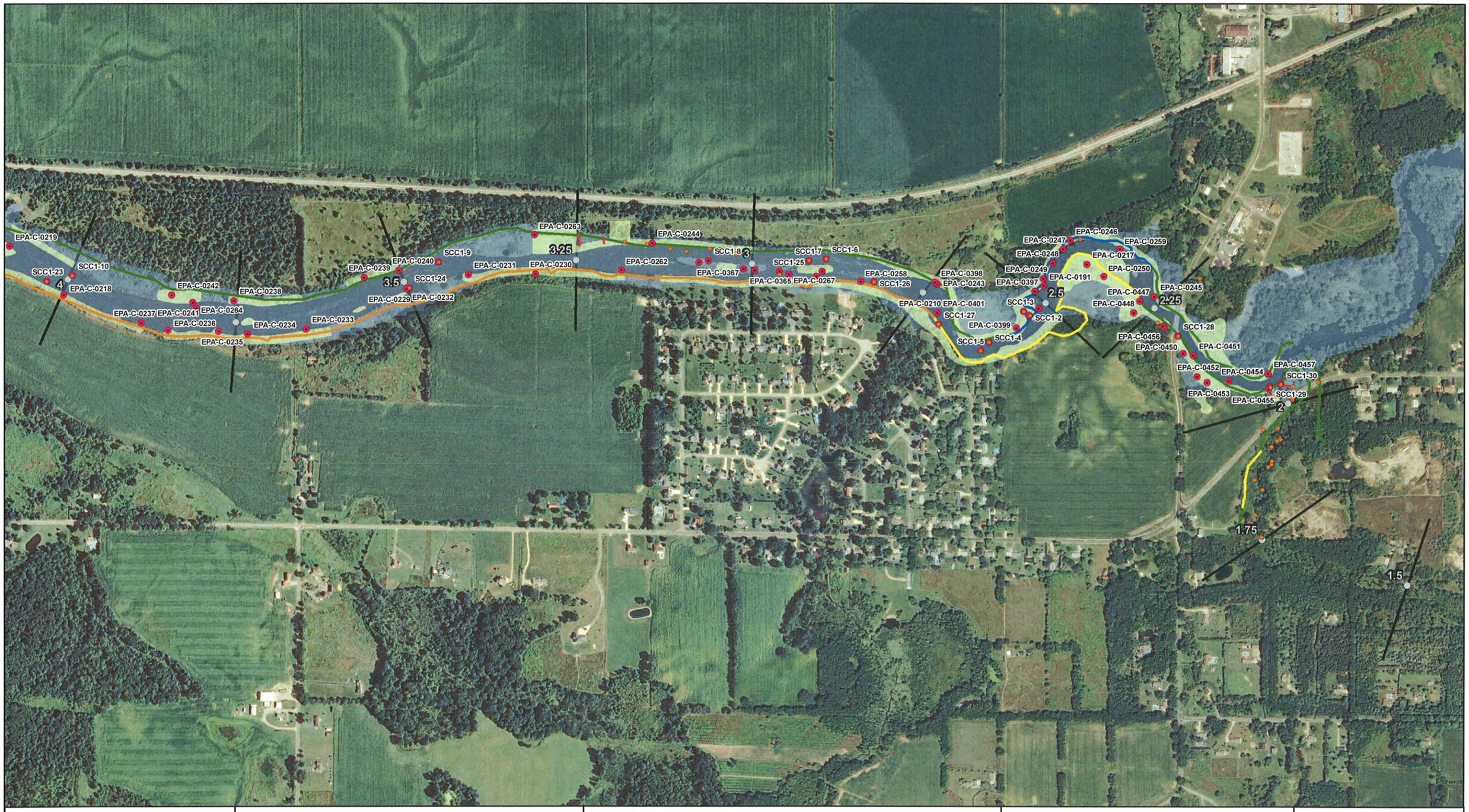
0 75 150 Feet

National Agriculture Imagery Program (NAIP)
Aerial Photography Flown in 2009

Figure 3

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet



Michigan

Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 1.75-4.0

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

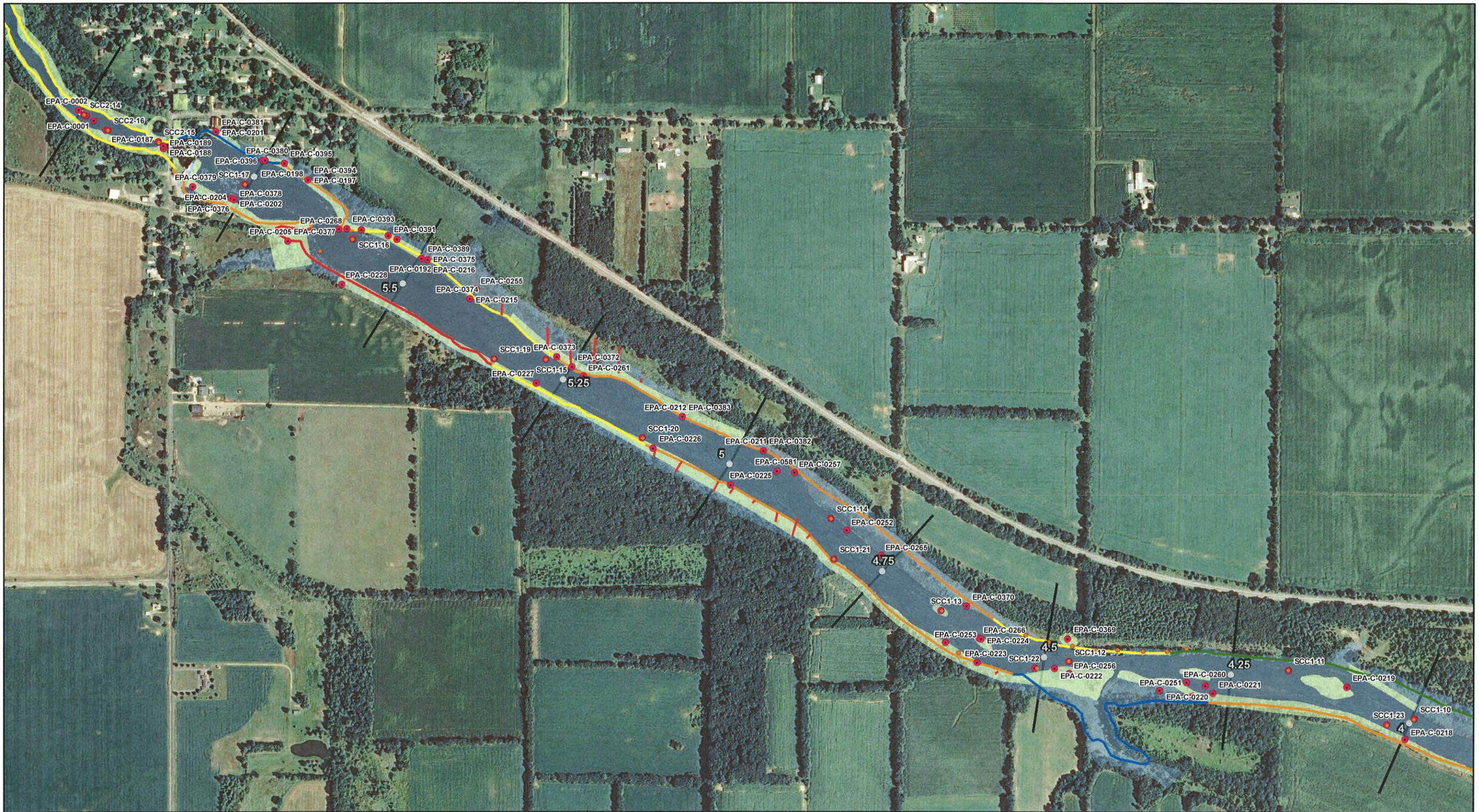
0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 1 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet



Michigan

Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 4.25-6.0

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

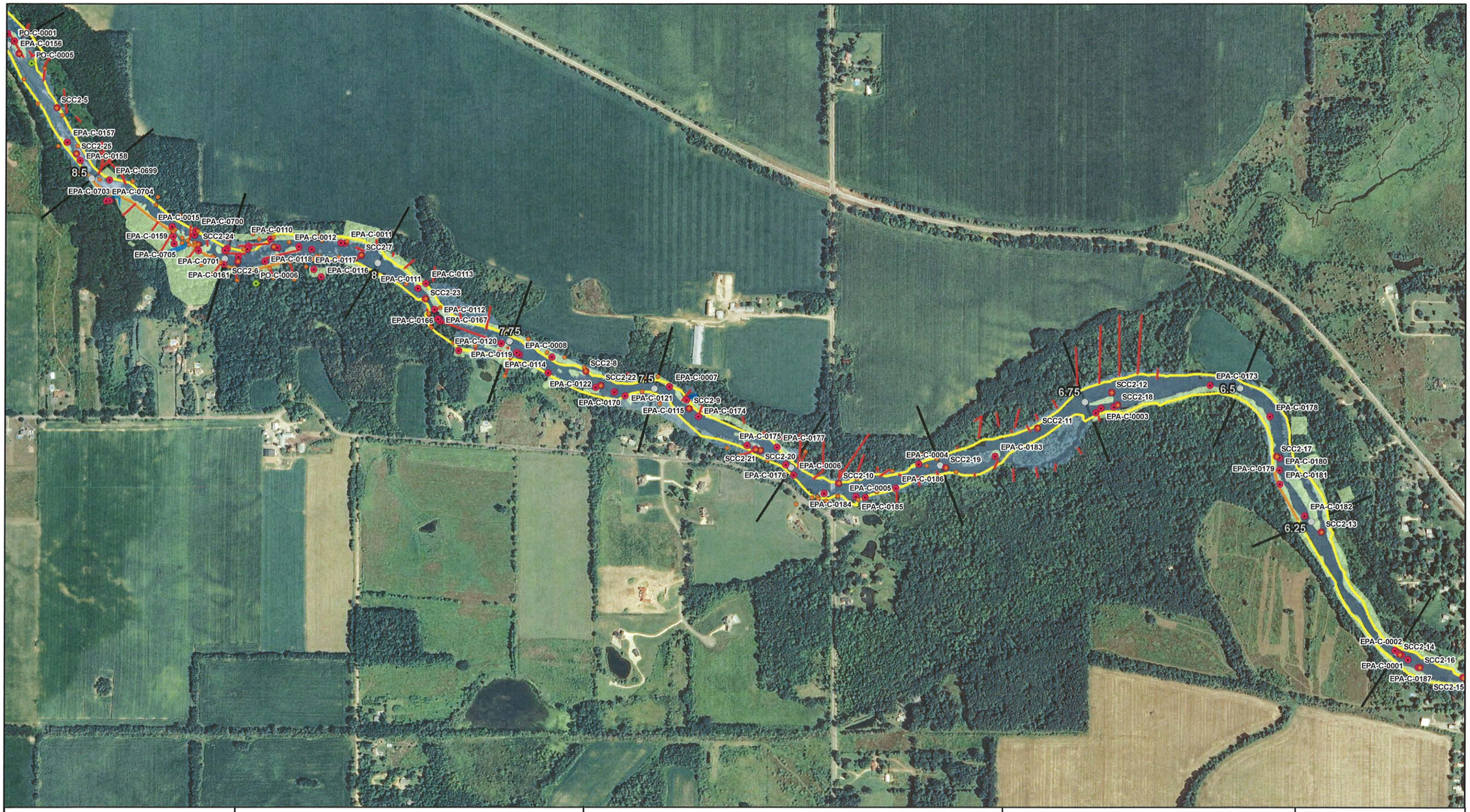
0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 2 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet





Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 6.25-8.5

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

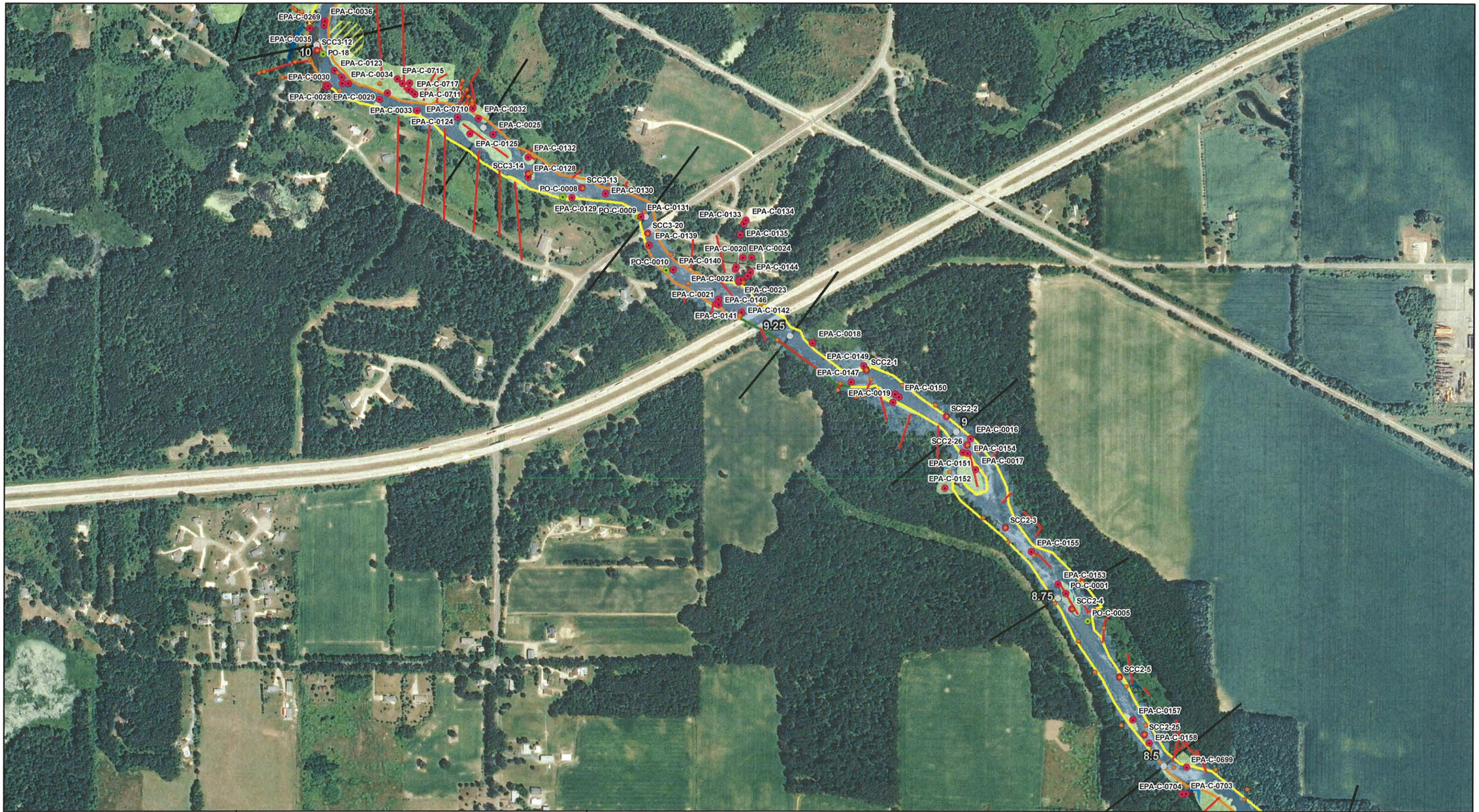
0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 3 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet





Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 8.75-10.0

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

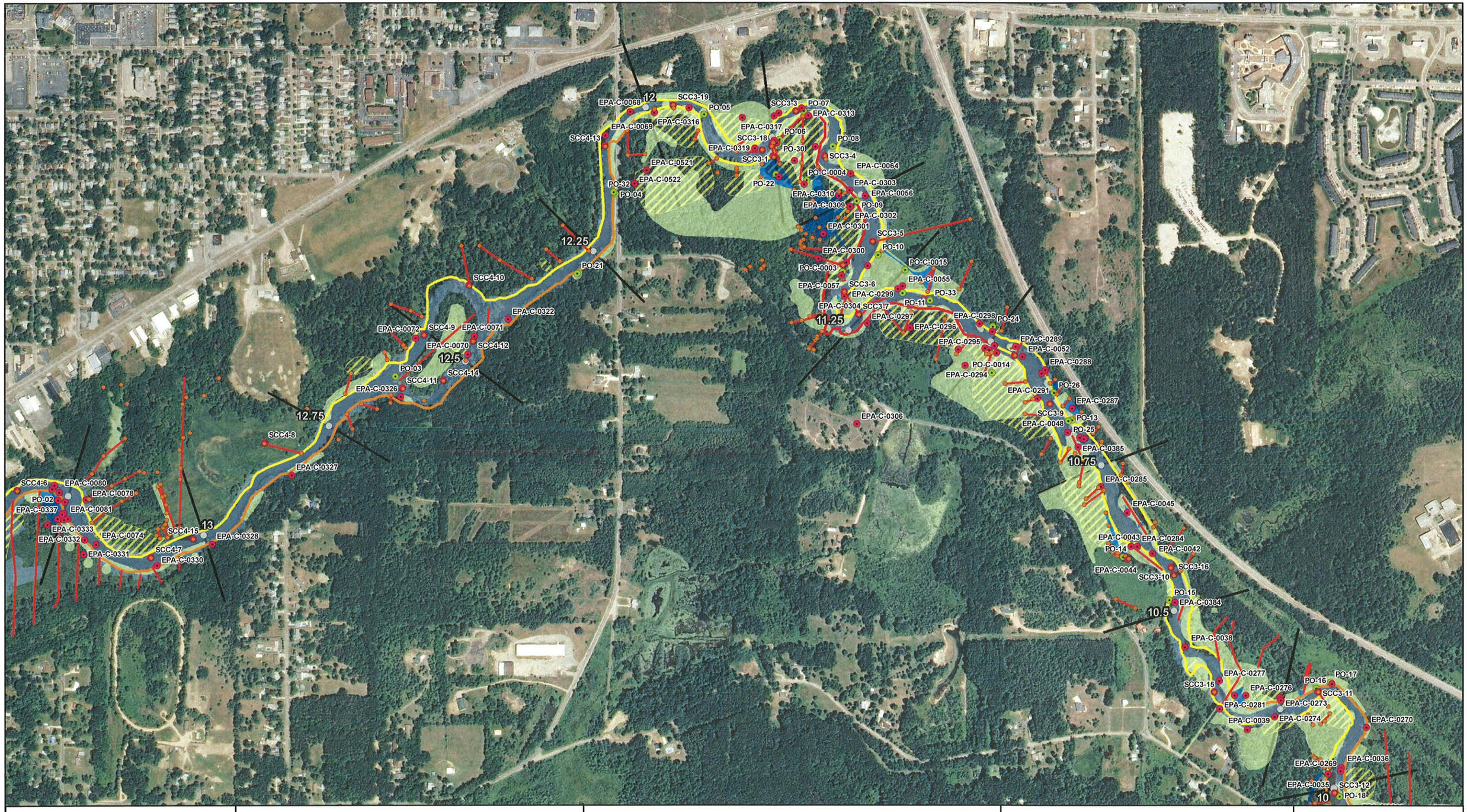
0 340 680 Feet

National Agriculture Imagery Program (NAIP)
Aerial Photography Flown in 2009

Figure 4: Map 4 of 17

ENBRIDGE

Coordinate System: NAD 1983 State Plane Michigan South Feet



Michigan



Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 10.25-13.25

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

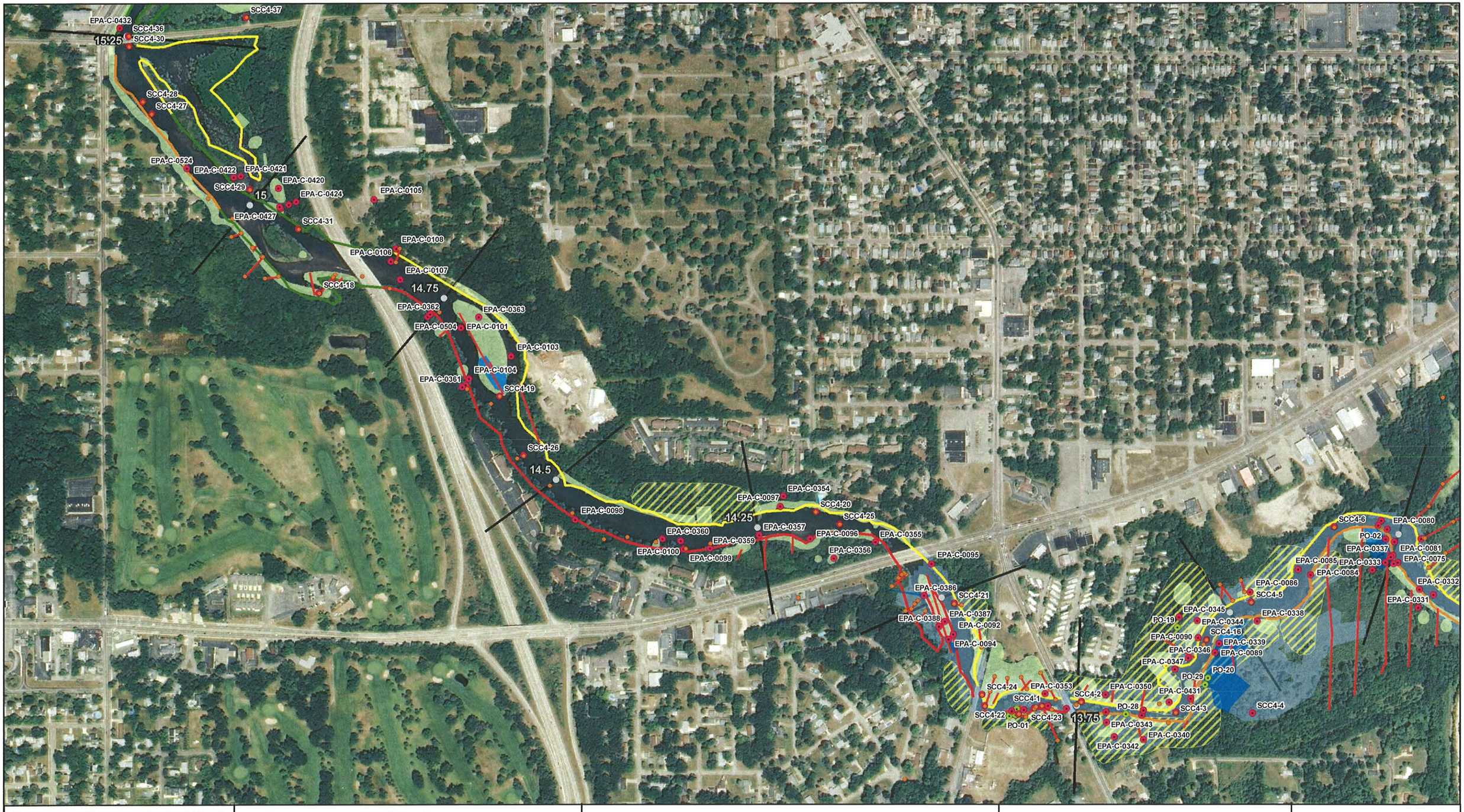
0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 5 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet





Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 13.5-15.25

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

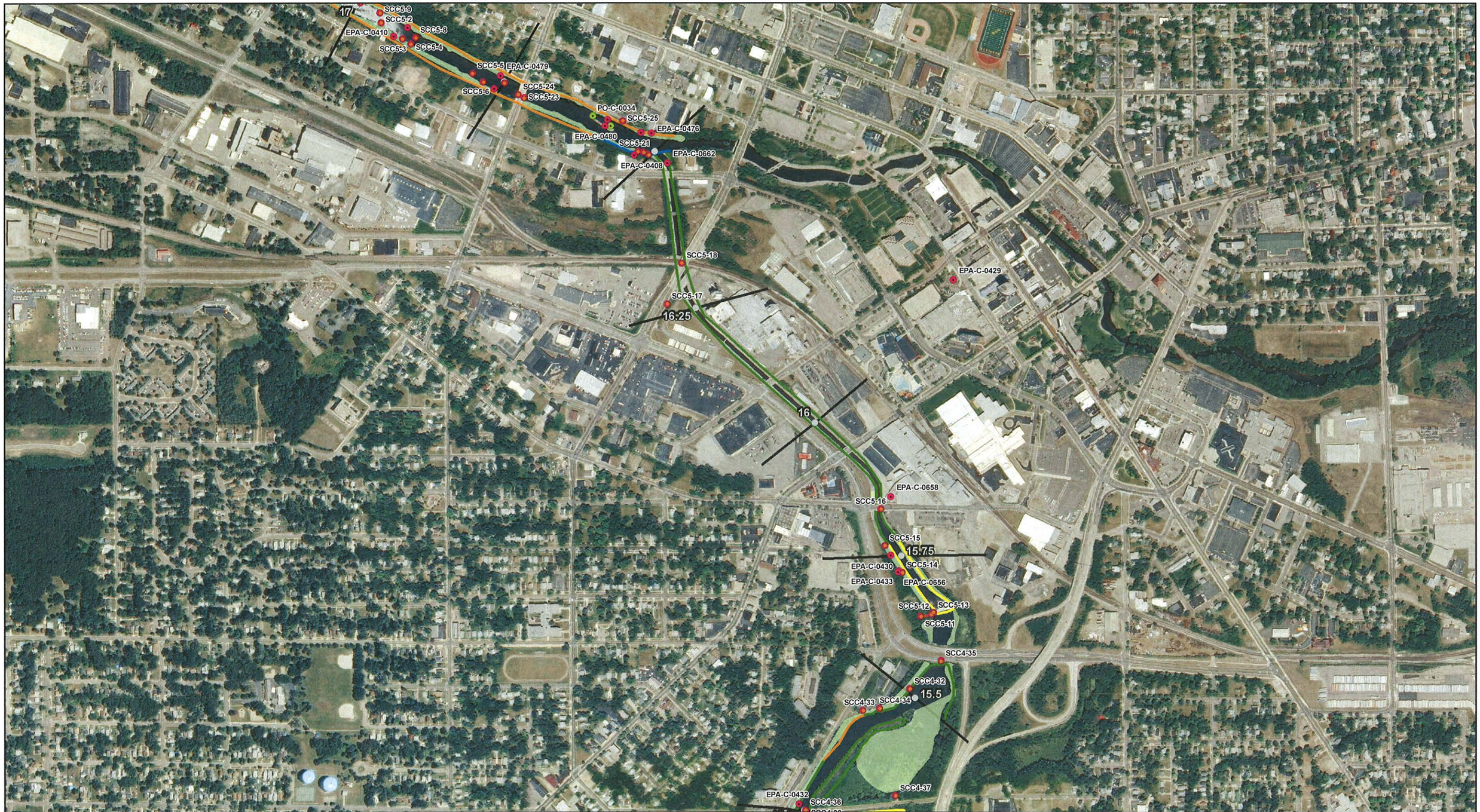
0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 6 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet



Michigan

Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 15.5-16.75

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

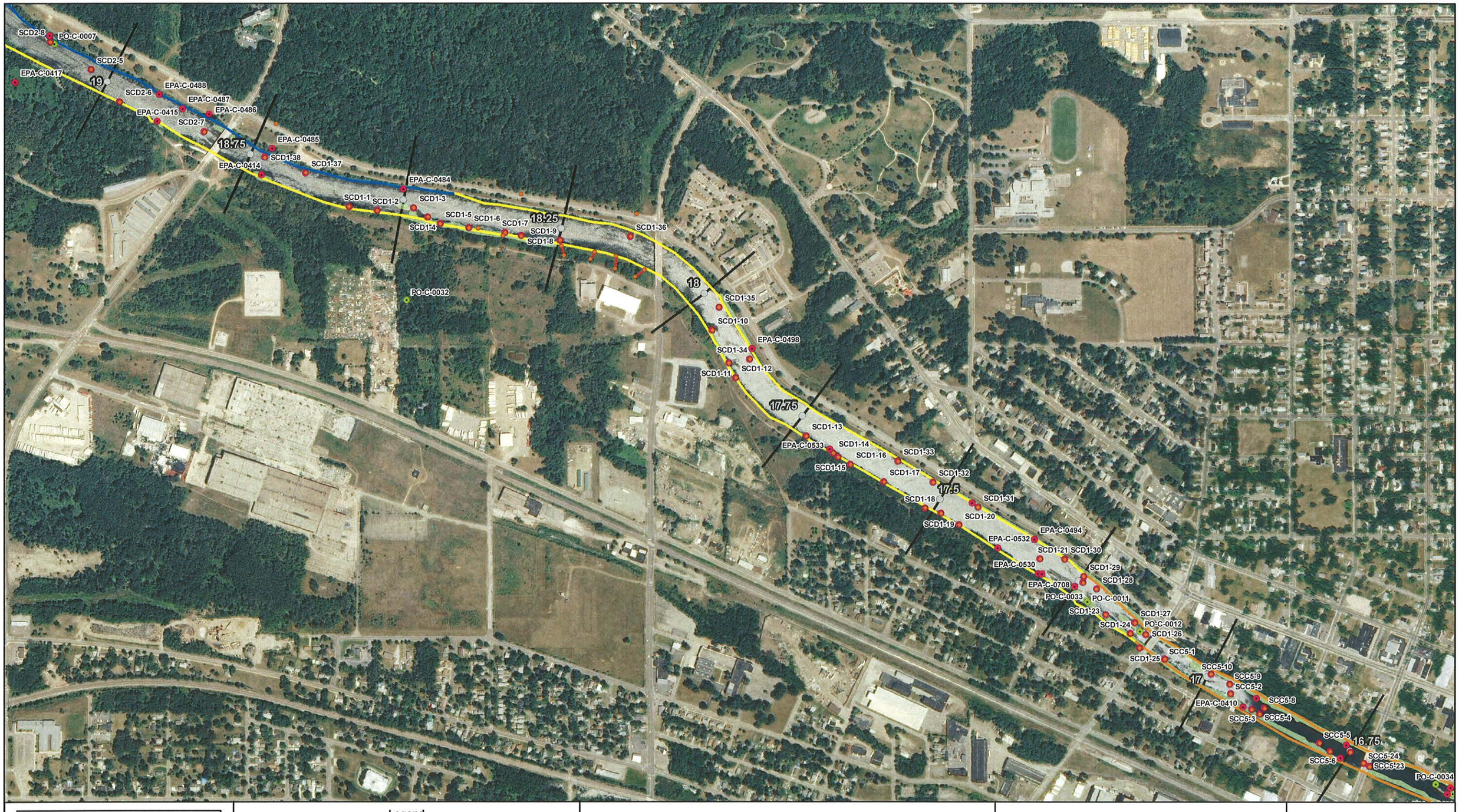
0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 7 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet





Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 17.0-19.0

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

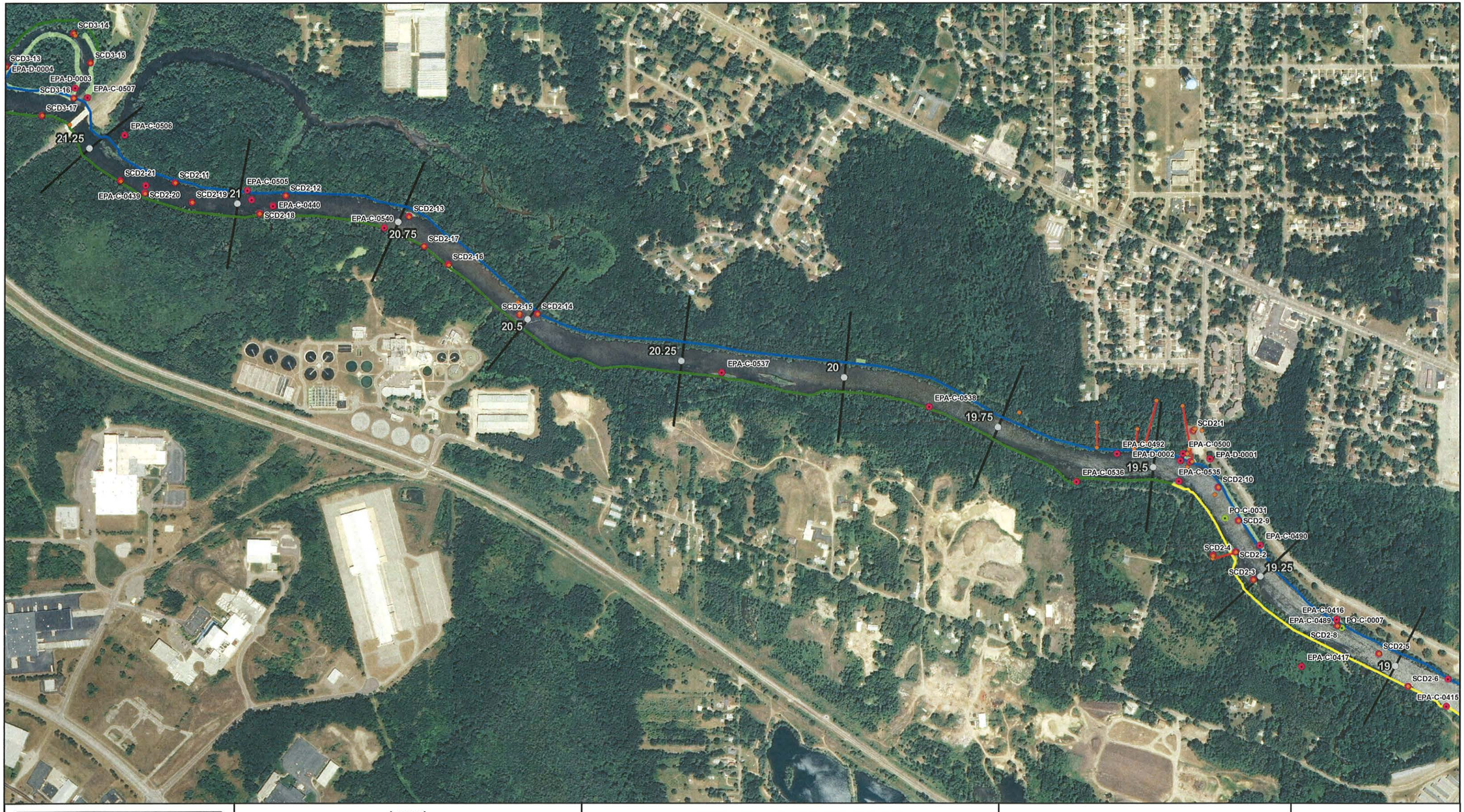
0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 8 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet





Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 19.25-21.25

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

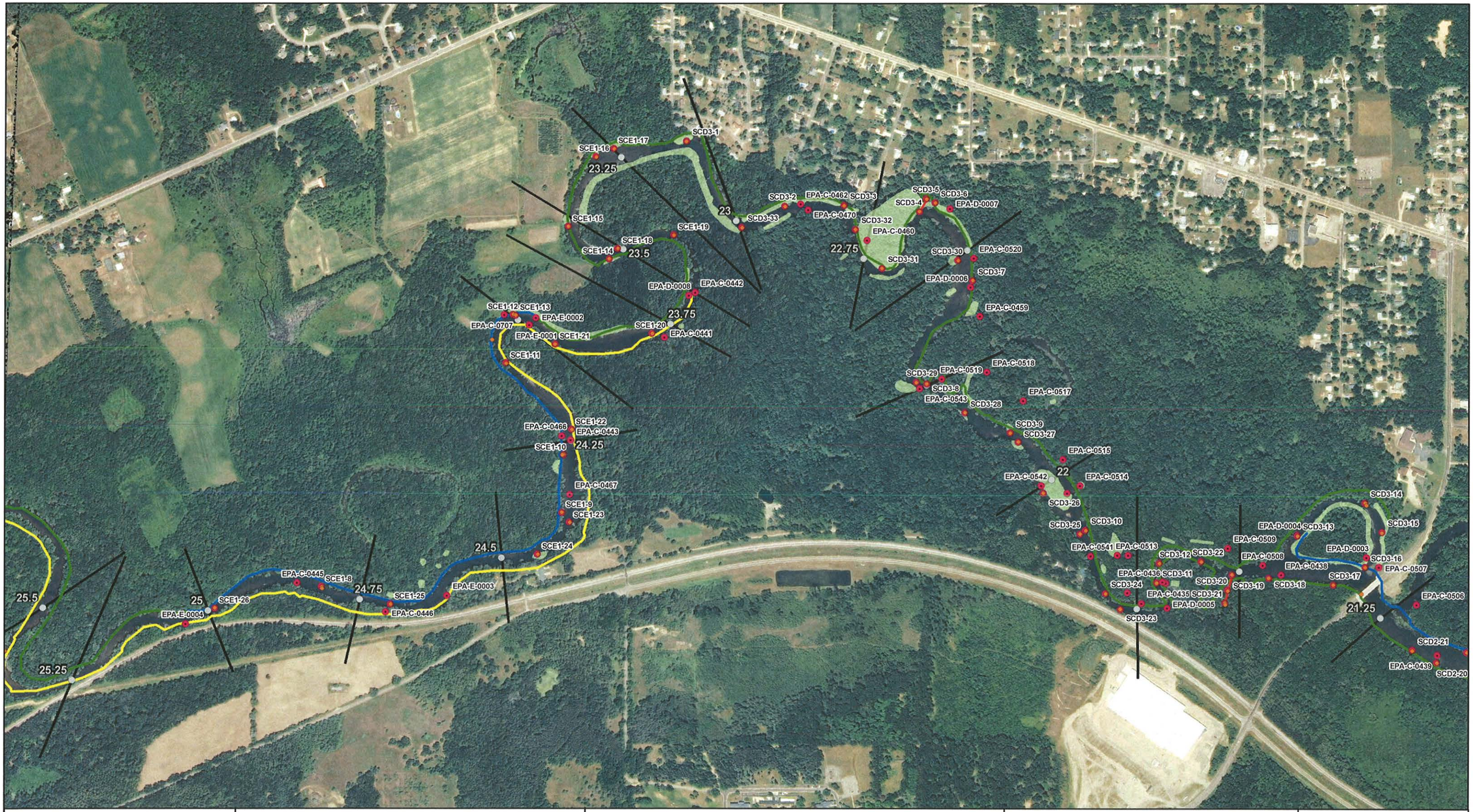
0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 9 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet



Michigan



Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 21.5-25.25

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 10 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet

EPA-C-0560
EPA-C-0561
26
EPA-E-0006
EPA-C-0562
EPA-E-0007
SCE1-5
SCE1-28
26.25
25.75
EPA-E-0005
EPA-C-0445
SCE1-8
25.5
25
SCE1-26
EPA-E-0004
SCE1-4
26.75
EPA-C-0551
EPA-E-0008
26.5
SCE1-27
25.25
EPA-C-0552
SCE1-29
SCE1-6
SCE1-7
27.25
SCE1-1
EPA-C-0563
27
EPA-C-0569
27.5
27.75
28
SCE1-3

Michigan

Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 25.5-28.0

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 11 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet

28
SCE1-3
28.25
EPA-C-0573
28.5
SCE1-2
28.75
EPA-E-0011
SCE2-4
EPA-E-0012
EPA-E-0013
EPA-E-0010
29
EPA-E-0015
29.25
EPA-E-0014
29.5
EPA-E-0016
29.75
EPA-E-0018
EPA-E-0017
SCE2-3
EPA-E-0019
EPA-E-0020
30
EPA-C-0676
EPA-C-0675
EPA-C-0674
EPA-C-0677

Michigan

Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 28.25-30.0

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 12 of 17

ENBRIDGE

Coordinate System: NAD 1983 State Plane Michigan South Feet

EPA-E-0017
SCE2-3
EPA-E-0019
EPA-E-0020
30
EPA-C-0676
EPA-C-0675
EPA-C-0674
EPA-C-0677
30.25
30.5
EPA-C-0678
SCE2-2
EPA-E-0022
EPA-E-0021
30.75
SCE2-7
31
EPA-E-0024
EPA-E-0023
31.25
EPA-E-0025
31.5
EPA-E-0026
31.75

Michigan

Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 30.25-31.75

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

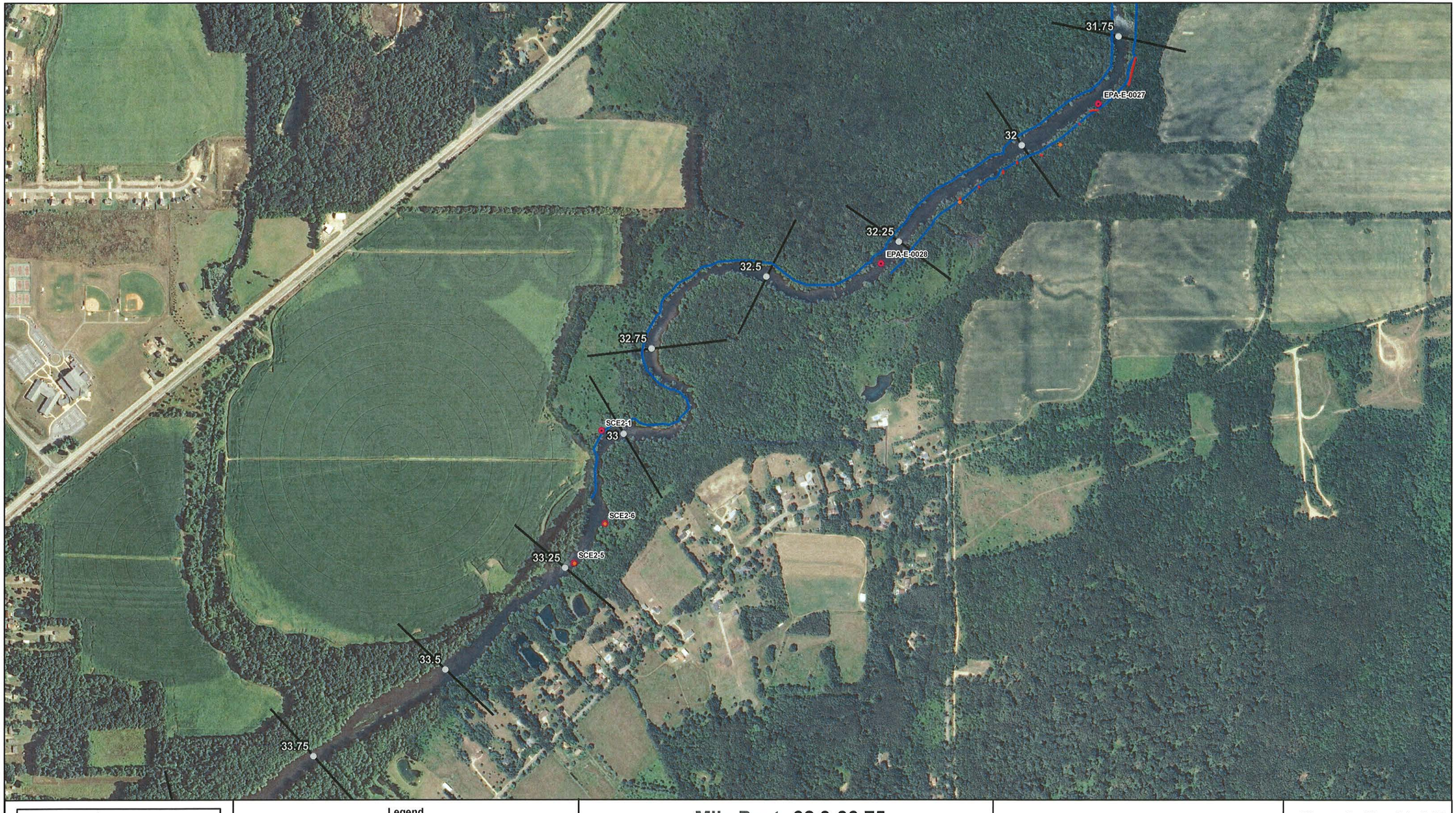
0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 13 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet



Michigan

Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 32.0-33.75

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

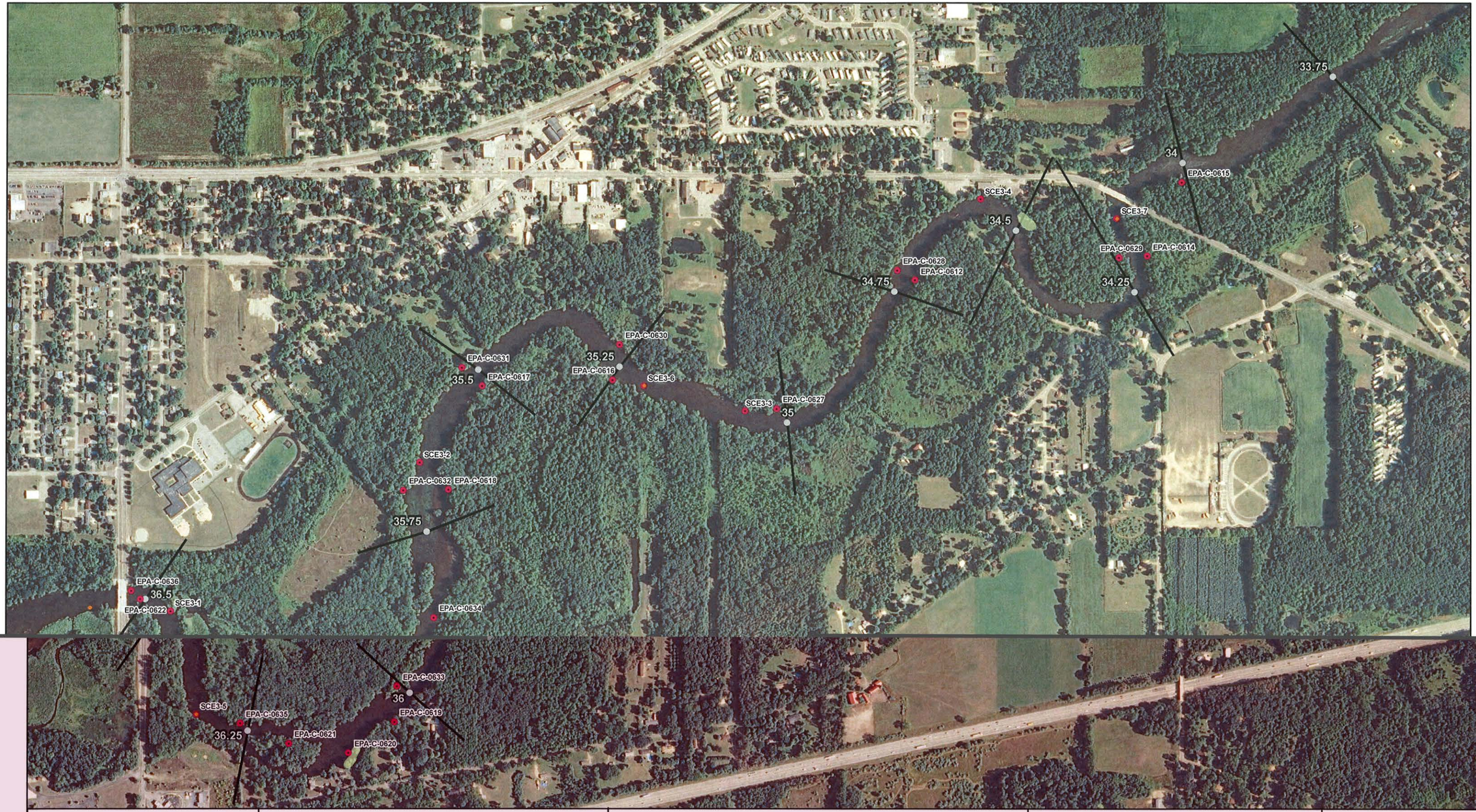
0 340 680 Feet

National Agriculture Imagery Program (NAIP) Aerial Photography Flown in 2009

Figure 4: Map 14 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet



Michigan

Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 34.0-36.5

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 340 680 Feet

National Agriculture Imagery Program (NAIP)
Aerial Photography Flown in 2009

Figure 4: Map 15 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet

SCE4-6
SCE4-5
EPA-C-0596
EPA-C-0597
EPA-C-0598
EPA-C-0594
SCE4-1
SCE4-2
EPA-C-0600
EPA-C-0599
SCE4-3
EPA-C-0305
EPA-C-0323
EPA-C-0601
EPA-C-0602
EPA-C-0603
EPA-C-0604
SCE4-7
SCE4-8
EPA-C-0638
EPA-C-0624
EPA-C-0623
EPA-C-0636
EPA-C-0622
SCE3-1
EPA-C-0637
SCE3-5
EPA-C-0635
SCE4-9

38.5
38.25
38
37.75
37.5
37.25
37
36.75
36.5

Michigan

Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 36.75-38.5

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 340 680 Feet

National Agriculture Imagery Program (NAIP)
Aerial Photography Flown in 2009

Figure 4: Map 16 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet

41
40.75
40.5
40.25
40
39.75
39.5
39.25
39
38.75
38.5
EPA-C-0589
EPA-C-0590
SCE4-4
EPA-C-0591
EPA-C-0592
EPA-C-0593
EPA-C-0595
SCE4-6
SCE4-5
EPA-C-0596
EPA-C-0594

Michigan

Legend

- Operational Focus Area
- Pooled Oil
- River Quarter Miles
- Approximate Release Area
- Divison Grid
- Floodplain Waypoint
- Floodplain Transect
- NRDA Floodplain
- 7 ft yr Inundated Floodplain
- SCAT Oil Delineation Area
- START Contractor Data

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Mile Post: 38.75-41.25

SCAT, NRDA, USEPA START Contractor, & 7 ft Inundated/25-year Floodplain Map

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 340 680
Feet

National Agriculture Imagery Program (NAIP)
Aerial Photography Flown in 2009

Figure 4: Map 17 of 17

ENBRIDGE™

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix I
Enbridge Line 6B Mile Post 608 Pipeline Release Oil Recovery Reports (Provided Electronically on CD)

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 2.5 – MP 2.25-2.5

Enbridge Energy

September 24, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 2.5 had very light levels of oil staining at the very upstream portion of the left descending bank and light levels of oil staining throughout the rest of the segment. Surface oil residue, tar and oiled vegetation were observed along this shoreline as well as throughout the overbank. Specifically, SCAT teams noted oiled vegetation and debris, oiled overhanging vegetation and pooled oil within a palustrine emergent wetland, consisting of 80% canary grass and 20 % scrub-shrub, on the left descending bank/overbank mid-segment. During assessment of the island, located in the upstream portion of the segment off the right descending bank, an 8 foot by 15 foot pool of oil and tarred vegetation covered in brush were observed on the upstream end, as well as several log jams surrounded by floating oil. During the initial shoreline assessment, the right descending bank had very light levels of oil staining in the upstream portion of the segment and no oil staining throughout the rest of the segment. At the time of SCAT assessment, patches of surface oil residue and tar coated vegetation and debris, ranging from less than 1% cover to 10 % cover, were observed throughout the entire shoreline. In addition, sheen was observed while walking through aquatic plants off the right descending bank, in the upstream portion of the segment near mile marker 2.25.

Actions

The shoreline clean-up activities within Segment 2.5 consisted of the following:

- Cut and bag low hanging limbs extending over and into the water 2 inches above oiling level;
- Vegetation removal, leaving roots intact and woody plants greater than 2 inches in diameter;
- Manual removal of tarred soil;
- Removal of oiled herbaceous vegetation;
- Removal of oiled debris;
- Removal of pooled oil through absorption techniques;
- Removal of heavily oiled woody debris within log jams.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody vegetation and oiled soils remain on the island within the segment;
- Oil remains in areas where hand excavation of soil was performed. These areas should be maintained during Operations and Maintenance. Absorbents are recommended;

- Patches of tarred soil, totaling approximately 25 square feet, remains roughly 25 feet from the river on the left descending bank;
- Oiled vegetation remains within a scrub-shrub area in zone A;
- Surface water within zone A will be monitored during Operations and Maintenance. Hard boom around this area may be required.

Segment 2.5 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

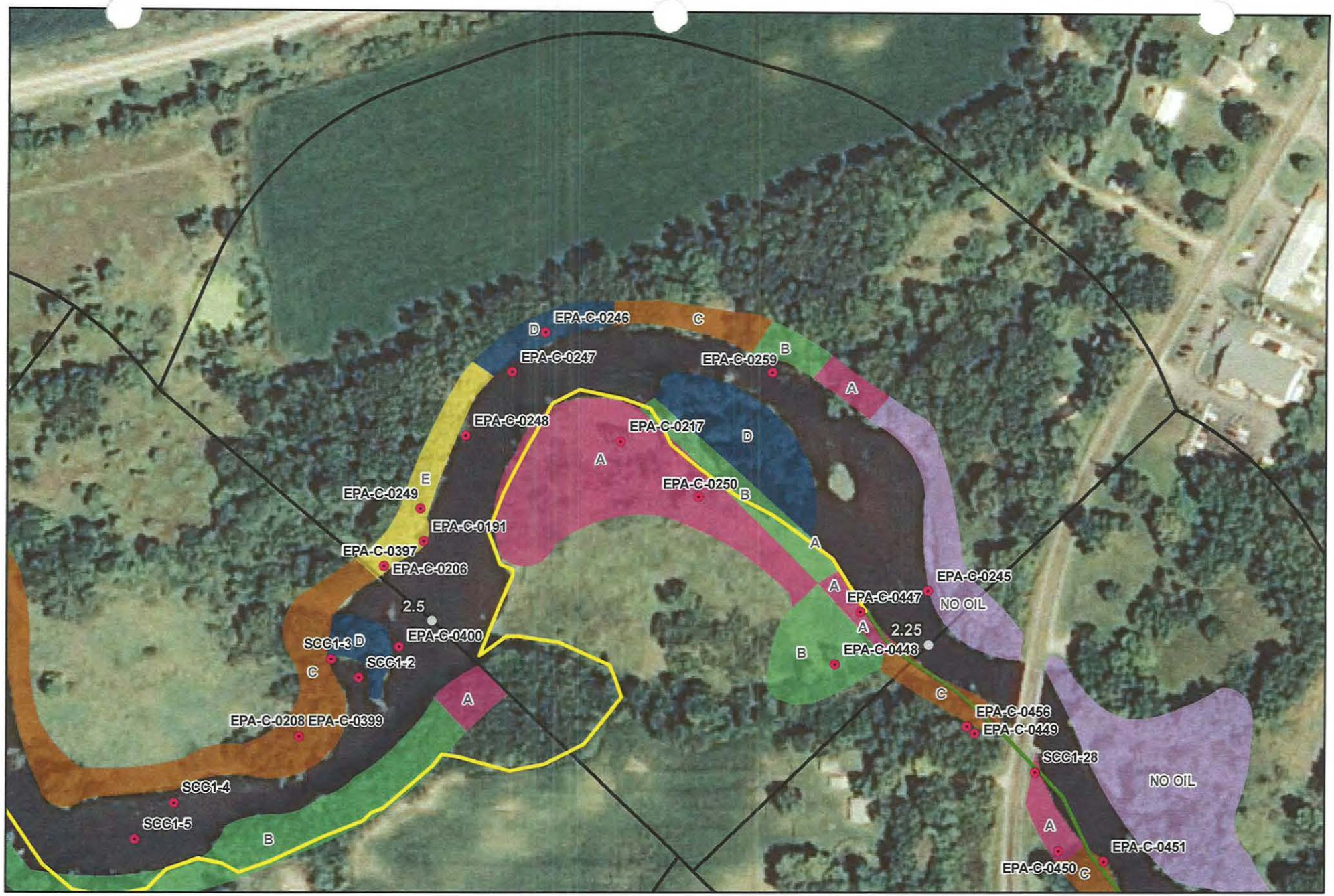
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release I. Jent - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 2.25-2.5 Left Bank While Looking Downstream									
SCC2-13	Shoreline	Shoreline Assessment			X	X			
EPA-C-0191	Shoreline	SCAT T1 08/22/2010	Island was partially cleared upstream end has pool 8 x 15 ft. (Pic #2.jpg is WP 009). Recommend remove oil in pool. Oil and tarred vegetation in covered brush at upstream end of island.					42.25913	-85.00193
EPA-C-0217	Shoreline/ Overbank	SCAT T1 8/25/10	Leave large diameter logs in place. Remove loose an overhanging vegetation, woody debris at WP37. Pooled oil observed. Absorb pooled oil at WP38 with absorbent pads and poms poms.					42.25889	-84.99290





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division D: Mile Marker 2.25-2.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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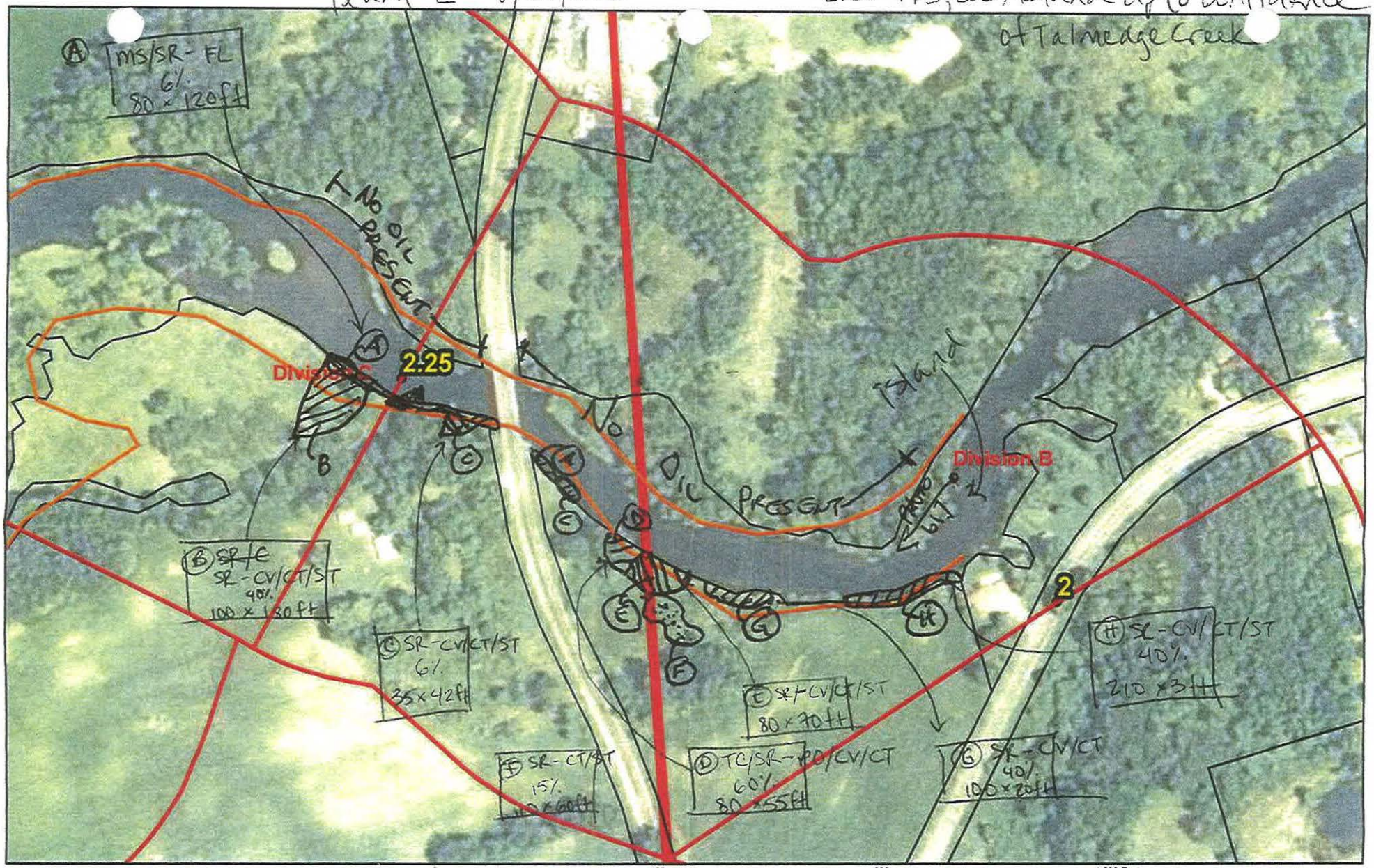
Coordinate System: NAD 1983 State Plane Michigan South Feet

Team 2 8/31/2010

2.25 RB, WD, Island up to confluence of Talmadge Creek



QuartermileMarkers
Parcels_10200ftBuffer
Shoreline
River_QuarterMiles
Division

2 to 2.25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
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Coordinate System: NAD 1983 STATE PLANE MICHIG... ...H FEET



DIVISION GRIDLINES

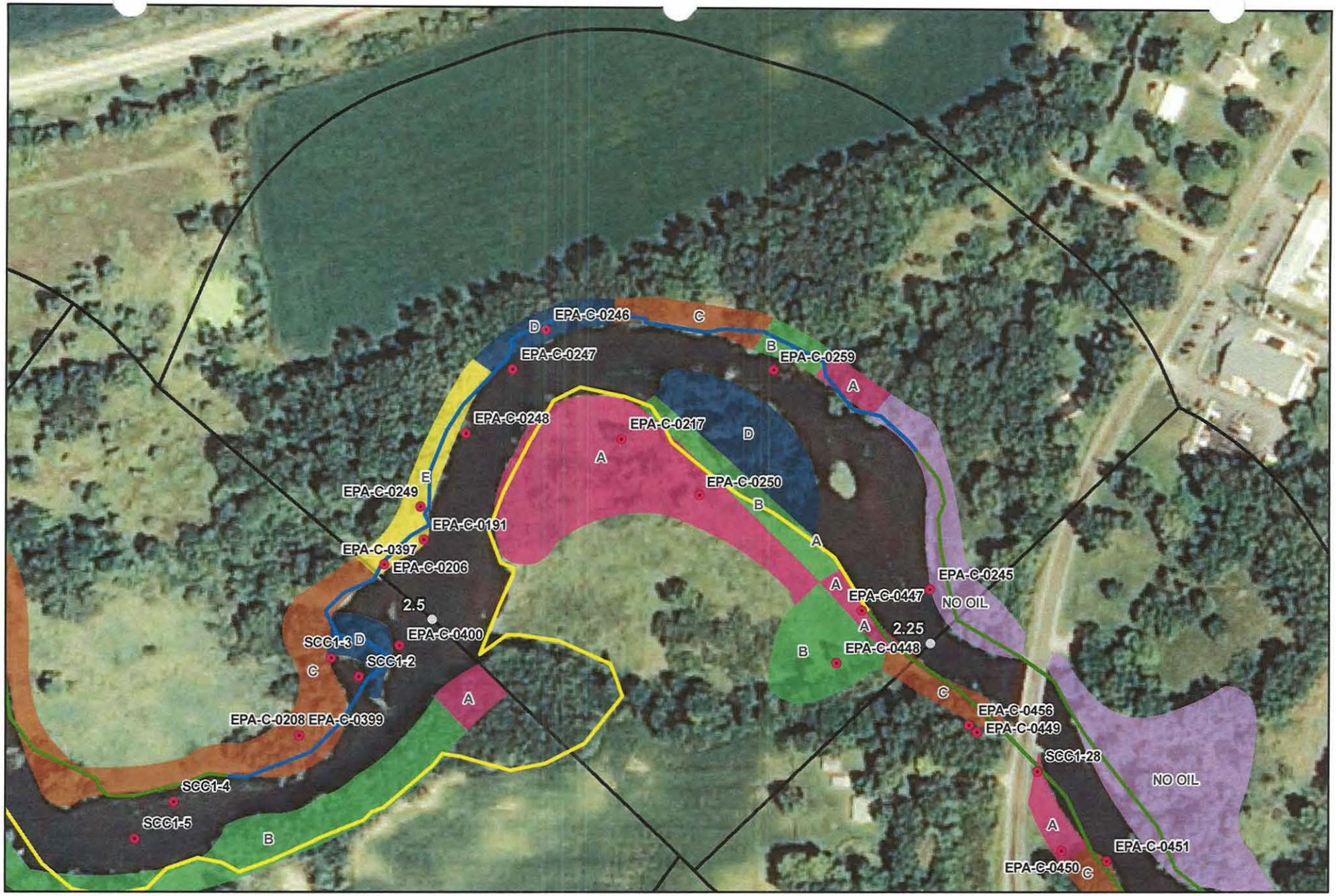
SHORELINE

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 2.25-2.5 Island									
SCC2-17	Shoreline	Shoreline Assessment	X		X	X	Log jams with floating oil.		





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

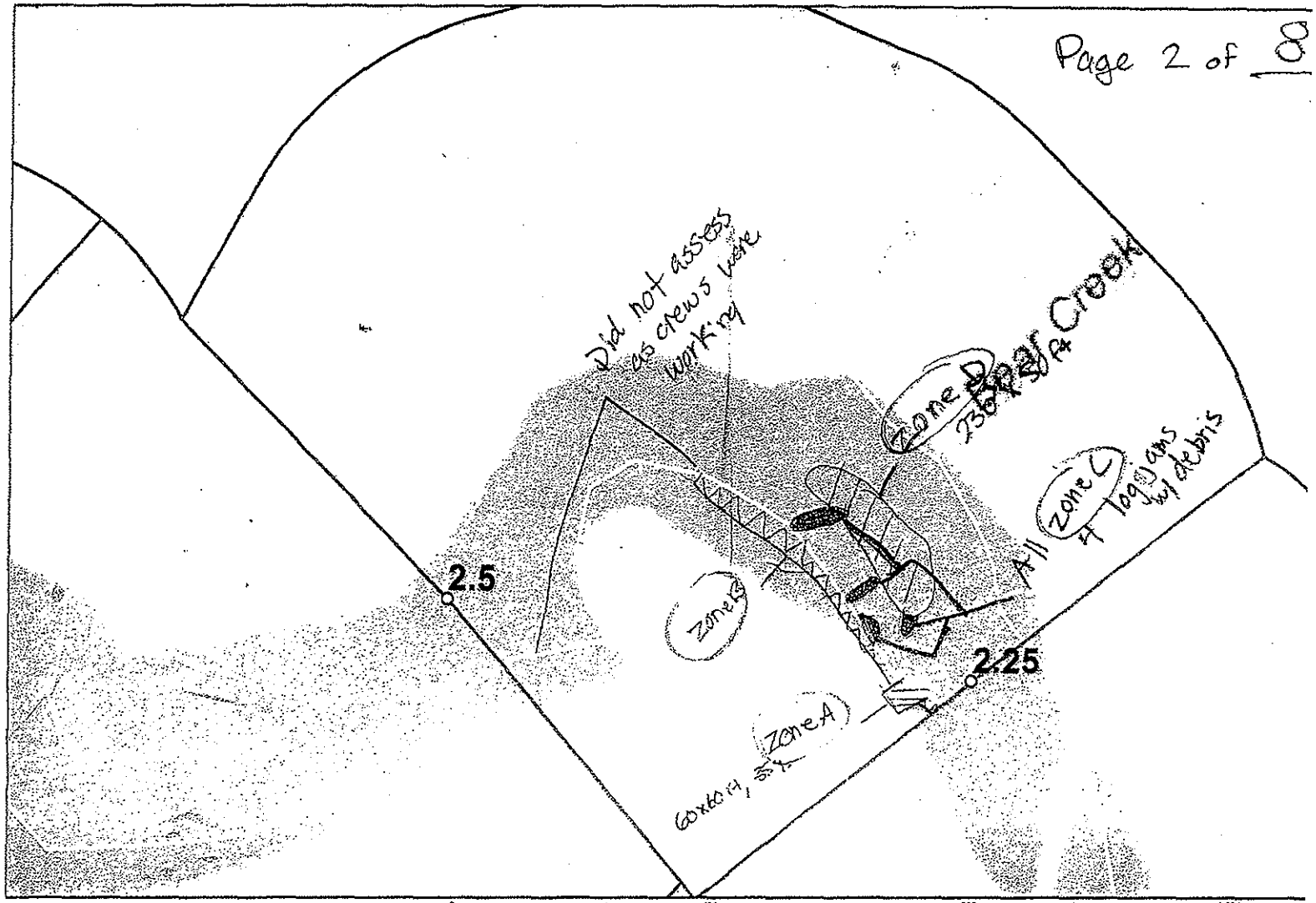
Division D: Mile Marker 2.25-2.5 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



DIVISION GRIDLINES

SHORELINE

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 05

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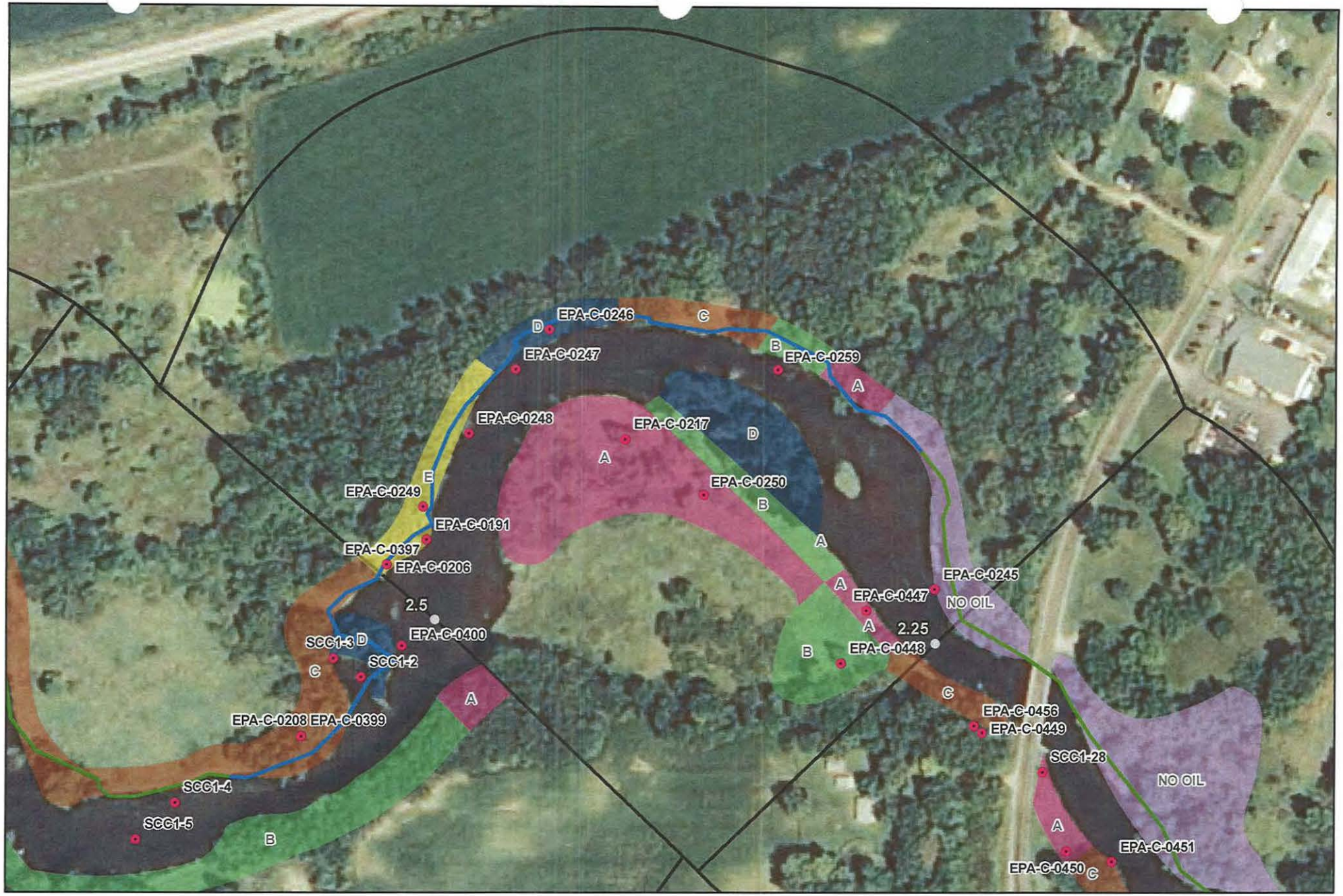
OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 2.25-2.5 Right Bank While Looking Downstream									
EPA-C-0245	Shoreline	SCAT T2 8/22/10	WP001.Loose woody debris on the ground covered in less than 1 percent oil Revmove smal branches and loose debris.					42.25893	-84.99885
EPA-C-0246	Shoreline	SCAT T2 8/22/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. WP005. Remove only oiled vegetation.					42.26008	-85.00120
EPA-C-0247	Shoreline	SCAT T2 8/22/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. WP006. log jam					42.25990	-85.00140
EPA-C-0248	Shoreline	SCAT T2 8/22/10	Mobilize and capture oil, do not remove oiled woody plants >4", remove oiled, small, non-anchored branches					42.25961	-85.00168
EPA-C-0249	Shoreline	SCAT T2 8/22/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. WP008 and WP009. Cut only oiled overhanging vegetation.					42.25928	-85.00195





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division D: Mile Marker 2.25-2.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

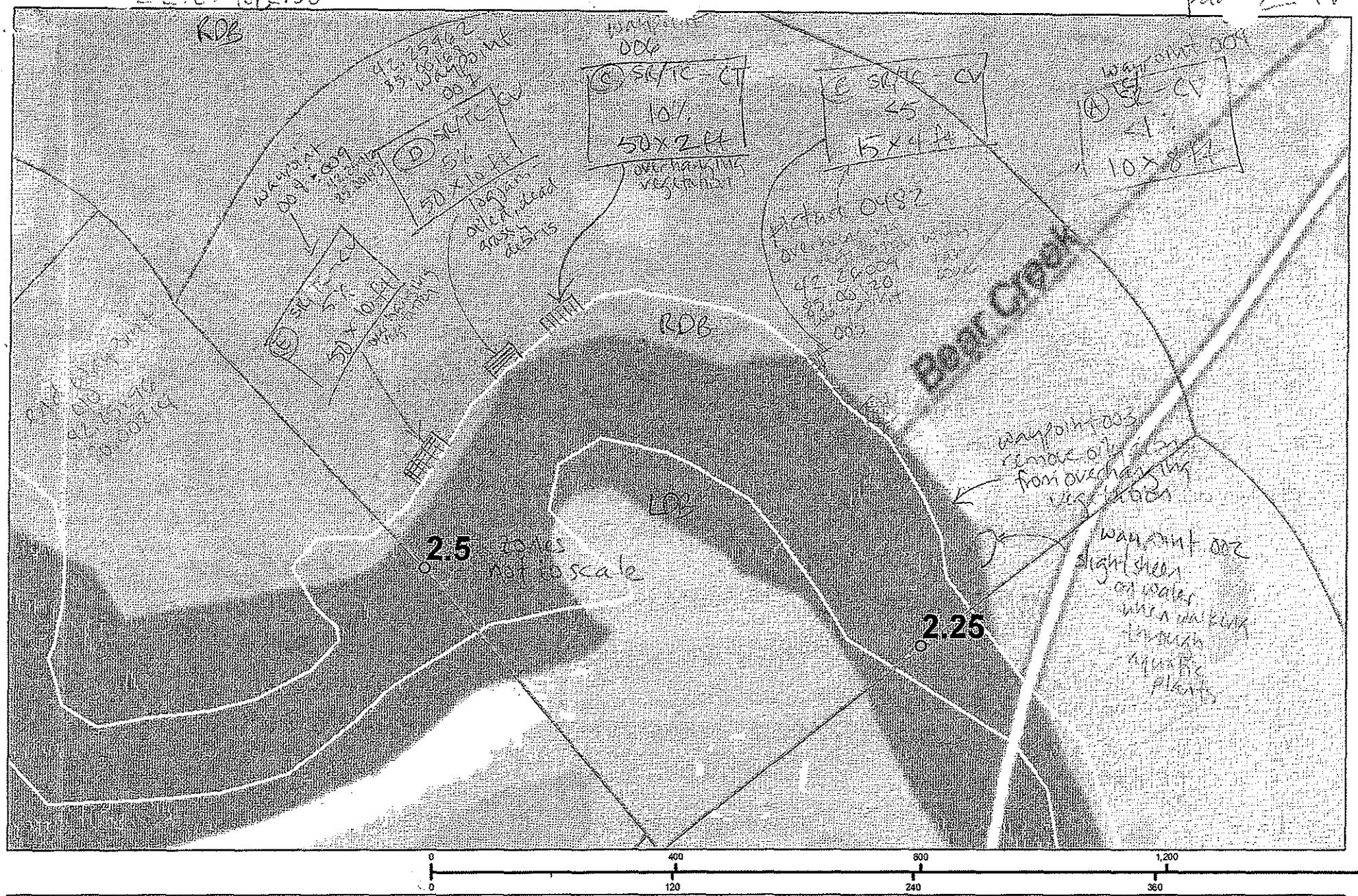
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



DIVISION GRIDLINES

SHORELINE

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Rele *Incident – Kalamazoo River Oil Spill*

Image: 2009 NAIP

SHEET #: 05

ENTRIX
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Coordinate Sys* NAD 1983 STATE
PLANE MICHI UTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/18/10 Time: AM / (PM)

Operations Division: 1 Segment ID: From 2.25 Start MP to End MP 2.50 Segment Length: 0.25 mile

Bank: (LDB) / (RDB) ☑ Island

Weather: (Sun)/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Chantel Strickland

Division Supervisor(Contractor): Wade Kannaway

SCAT Reviewed – Description of Clean Up Required

Recommendations are to Remove pooled oil, Cut overhanging Branches. Remove oil & TAR coated vegetation and remove debris

All SCAT Recommendations have been performed. See below

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Clean up of this Area included the Removal of pooled oil, Cutting over hanging Branches & Removal of tar coated vegetation & Debris

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Recommend to use Absorbents & maintain for Re-Surfacing oil in Areas where hand excavation of soil has been performed

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/19/10 Time: AM / (PM)

Operations Division: C Segment ID: From 2.25 Start MP to End MP 2.5 Segment Length: 0.25 mile

Bank: (LDB) / (RDB) ☒ Island Overbank: (LOB)/(ROB)

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: ELMER GUY TOWNER EL

Division Supervisor(Contractor): Doug Blakemore

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up Completed

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 2.25-2.5 Left Bank While Looking Downstream										
EPA-C-0217	Shoreline/ Overbank	SCAT T1 8/25/10	Leave large diameter logs in place. Remove loose an overhanging vegetation, woody debris at WP37. Pooled oil observed. Absorb pooled oil at WP38 with absorbent pads and poms poms.					42.25889	-84.99290	Y / N

Printed Team Members Name: Jack Boss, Enbridge. Kathleen Fairchild, DNRE Larisa Legnova, EPA
Date: 9/17/10
Comments:

MVL 9/22

Cleanup work is still in progress – need to revisit in one week ±

See O&M form

boundary for vegetation removal has been flagged

9/22/10 Mike Van Loon, Chris Conn, Ross DelRosario - cleanup work finished. Removed small oil patch by hand. No ~~clean up~~ further clean up needed (aside from O&M).

Note: EPA-C-0217 indicates all of Zone A, comments include, oiled vegetation at shoreline have been cut, oiled deposited at base of wetland vegetation, oiled depositions is extensive through the wetland at this zone overhanging vegetation and wood debris is tar coated, loose veg and woody debris that is oiled needs to be removed
Wetland observation
90% PM, emergent wetland w/ 80% reed canal grass. Also shrub aprox 20%. Also stinging nettle & purple loosestife.
Oil covering is at the base of the wetland vegetation. Petroleum odor throughout this zone.
Clean up recommendations for Wetland: Absorb pooled oil @ WP038 with absorbent pads& pom-poms.
Science Team should consider long term cleanup priorities of oiled wetland area which is large.

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 2.25-2.5 Island										
EPA-C-0191	Shoreline	SCAT T1 08/22/2010	Island was partially cleared upstream end has pool 8 x 15 ft. (Pic #2.jpg is WP 009). Recommend remove oil in pool. Oil and tarred vegetation in covered brush at upstream end of island.					42.25913	-85.00193	(Y) / N

Printed Team Members Name: Jack Boss, Enbridge Kathleen Fairchild, DNRE Larisa Leonova, EPA
Date: 9/17/10
Comments:

9/21/10 Mike Van Loan, Chris Conn, Ross DelRosario

Notes assume location on island, could not confirm if this location was on island the the beginning of the segment where an island is clearly denoted on the aerial map, it appears to be on the right descending bank towards the end of the segment.

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 2.25-2.5 Right Bank While Looking Downstream										
EPA-C-0245	Shoreline	SCAT T2 8/22/10	WP001.Loose woody debris on the ground covered in less than 1 percent oil. Remove smal branches and loose debris.					42.25893	-84.99885	(Y) / N
EPA-C-0246	Shoreline	SCAT T2 8/22/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. WP005. Remove only oiled vegetation.					42.26008	-85.00120	(Y) / N
EPA-C-0247	Shoreline	SCAT T2 8/22/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. WP006. log jam					42.25990	-85.00140	(Y) / N
EPA-C-0248	Shoreline	SCAT T2 8/22/10	Mobilize and capture oil, do not remove oiled woody plants >4", remove oiled, small, non-anchored branches					42.25961	-85.00168	(Y) / N
EPA-C-0249	Shoreline	SCAT T2 8/22/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. WP008 and WP009. Cut only oiled overhanging vegetation.					42.25928	-85.00195	(Y) / N

Printed Team Members Name: Jack Boss Enbridge
Kathleen Fairchild, DNRE
Larisa Leonova, EPA

Date: 9/17/10

Comments:

WP 259 found, no recommendations given, no issues

9/22/10 Mike VanLoan, Chris Conn, Ross DelRosario

Please note that EPA-C-0206 on the aerial map is not in this segment, it is in segment 2.75 (recommendations table) and will be confirmed as such.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 2.25 to MP 2.50 Segment Length: 0.25 mile

1. **SCAT** ☒

2. **Clean up** ☑

3. **Inspection**

Signature DAVE HODEK 9/16/2010 (date) Enbridge

Signature Eduardo Rovira 9/16/10 (date) EPA

4. **SCAT Reassessment**

Signature Michael VanLoan 9/22/10 (date) Enbridge

Signature ROSS DELROSARIO 9/22/10 (date) EPA

Signature Chris Conn 9/22/10 (date) MDNRE

5. **EPA**

Signature Steven Hirsh 9/24/2010 (date) EPA Division Supervisor

① OEM required vicinity MP 2.25, LBD (SAT # EPA-C-0448) including periodic inspections, development of mitigative measures if necessary

② Booms vic MP 2.25 LBD require periodic maintenance.

Appendix E
Photographs

Field Photo Log – Segment 2.5



Photo 0758 – Facing southwest at right descending bank.



Photo 0762 – Facing east at right descending bank near EPA-C-0259.

Field Photo Log – Segment 2.5



Photo 0763 – Facing west at left descending bank near EPA-C-0246.



Photo 0764 – Facing northwest at right descending bank near EPA-C-0247.

Field Photo Log – Segment 2.5



Photo 0766 – Facing west at right descending bank near EPA-C-0248.



Photo 0767 – Facing west at right descending bank near EPA-C-0249/EPC-C-0191.

Field Photo Log – Segment 2.5



Photo 0769 – Facing southwest at left descending overbank in zone A.



Photo 0771 – Facing southeast at left descending overbank near EPA-C-0250 in zone A.

Field Photo Log – Segment 2.5



Photo 0775 – Facing southeast at left descending bank near in zone A.



Photo 0779 – Facing southeast at island.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 2.75 – MP 2.50 to 2.75

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 2.75 had light to moderate oiling and three oiled residential docks on the left descending bank. An island was present with pools of oil and oiled vegetation observed. Very light oiling, and local deposits of naturally attenuated oil were observed on the right descending bank. The overbank contained no areas requiring clean-up.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 2.75 consisted of the following:

- Removal of pooled oil (overbank only);
- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs;
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads;
- Removal of oiled debris;
- Mechanical removal of aquatic vegetation.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along left descending bank, along the upstream end of the island and along the right descending bank, near SCC1-4;

- Oiled woody vegetation on right descending bank near SCC1-3;
- Oiled herbaceous vegetation on the right descending bank near MP 2.50;
- Oiled rocks and cobble along the left descending bank near the midpoint of segment;
- Oiled docks near MP 2.75 and SCC1-5.

Segment 2.75 reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch maps)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

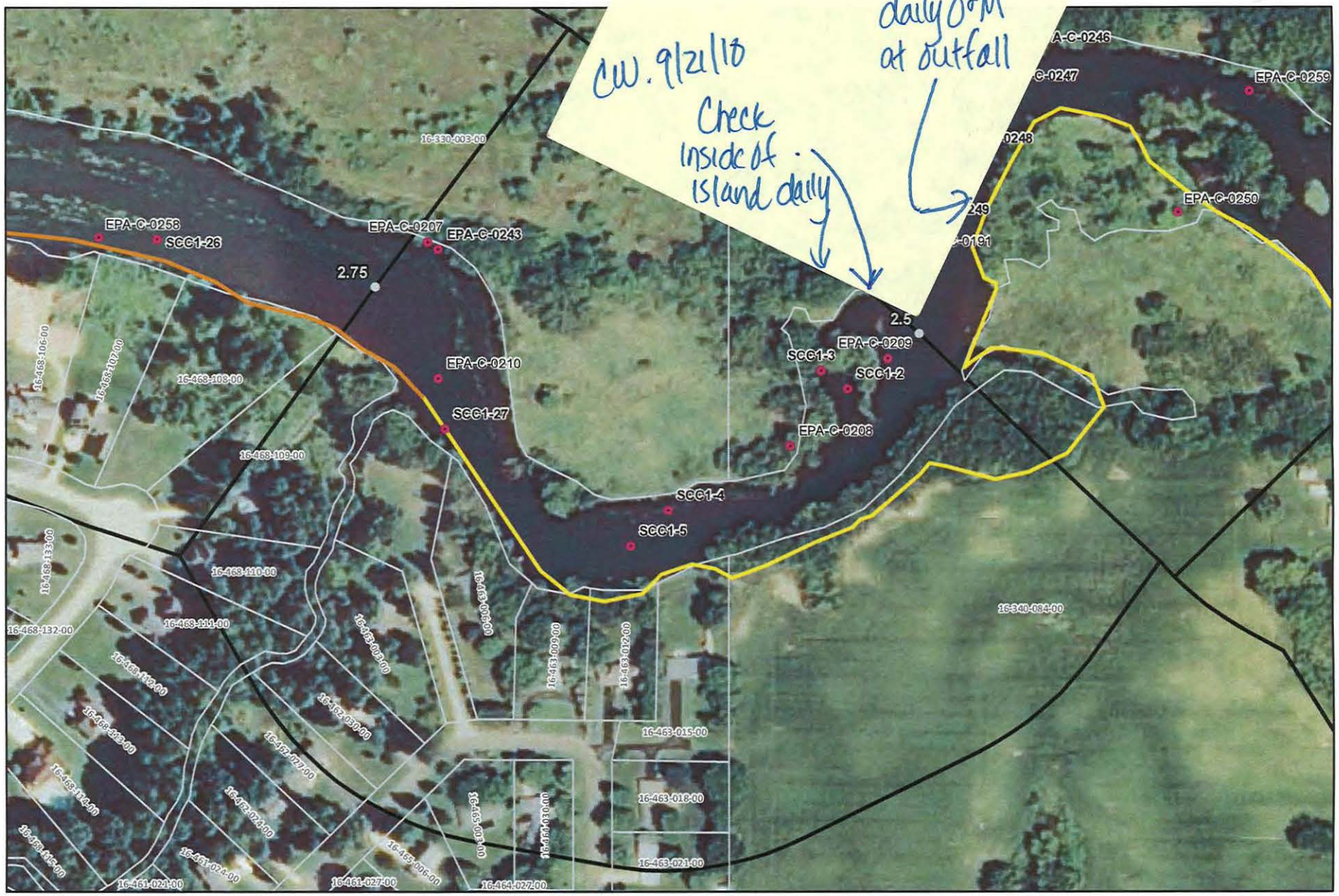
Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 2.5-2.75 Left Bank While Looking Downstream									
SCC1-4	Shoreline	Shoreline Assessment					1 oiled residential dock	42.25795	-85.00343
SCC1-5	Shoreline	Shoreline Assessment			•		2 oiled residential docks	42.25778	-85.00367
SCC1-27	Shoreline	Shoreline Assessment	•		•	•	Mechanical?	42.25832	-85.00483





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 2.5-2.75
Left Bank While Looking Downstream

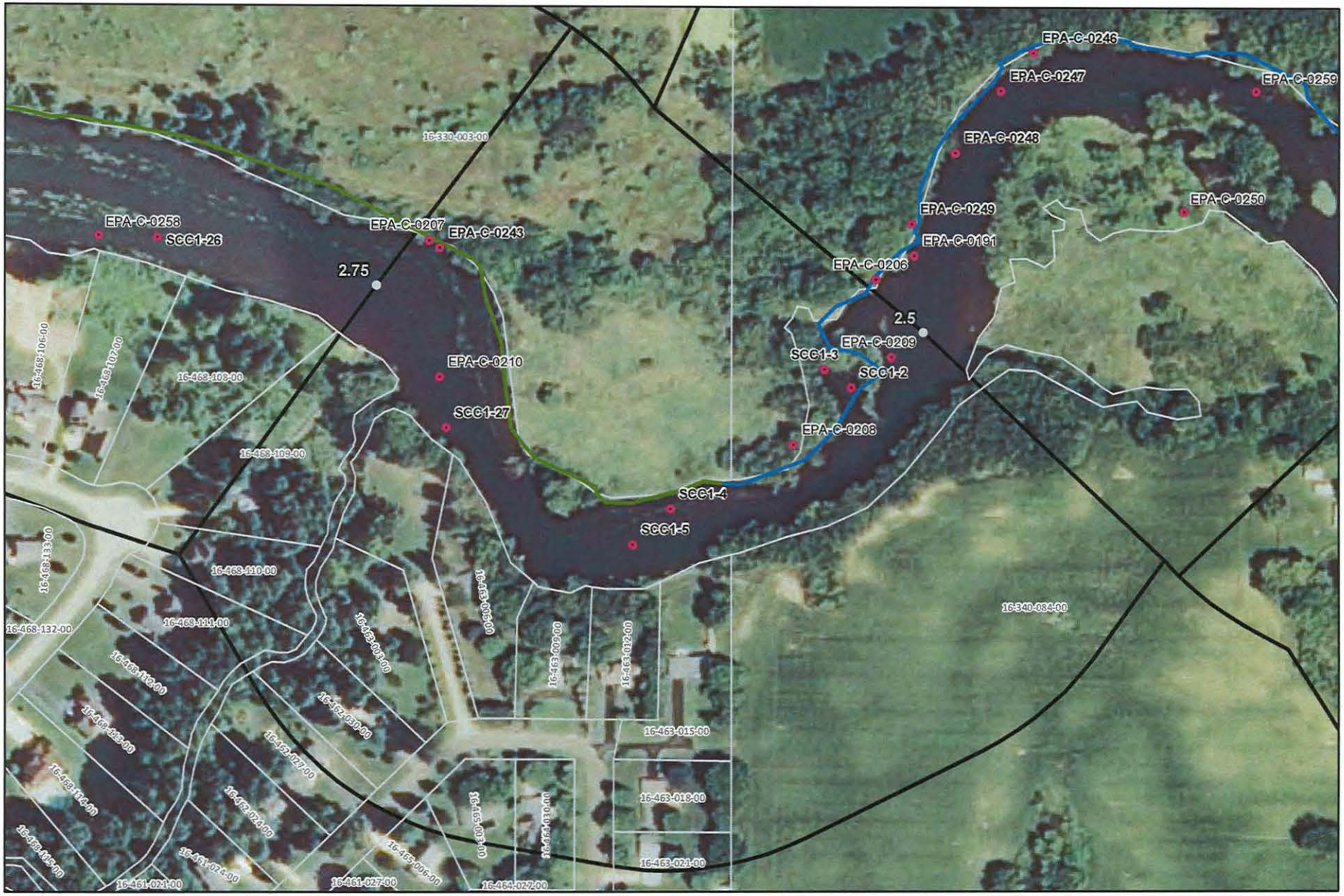
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 2.5-2.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

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Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

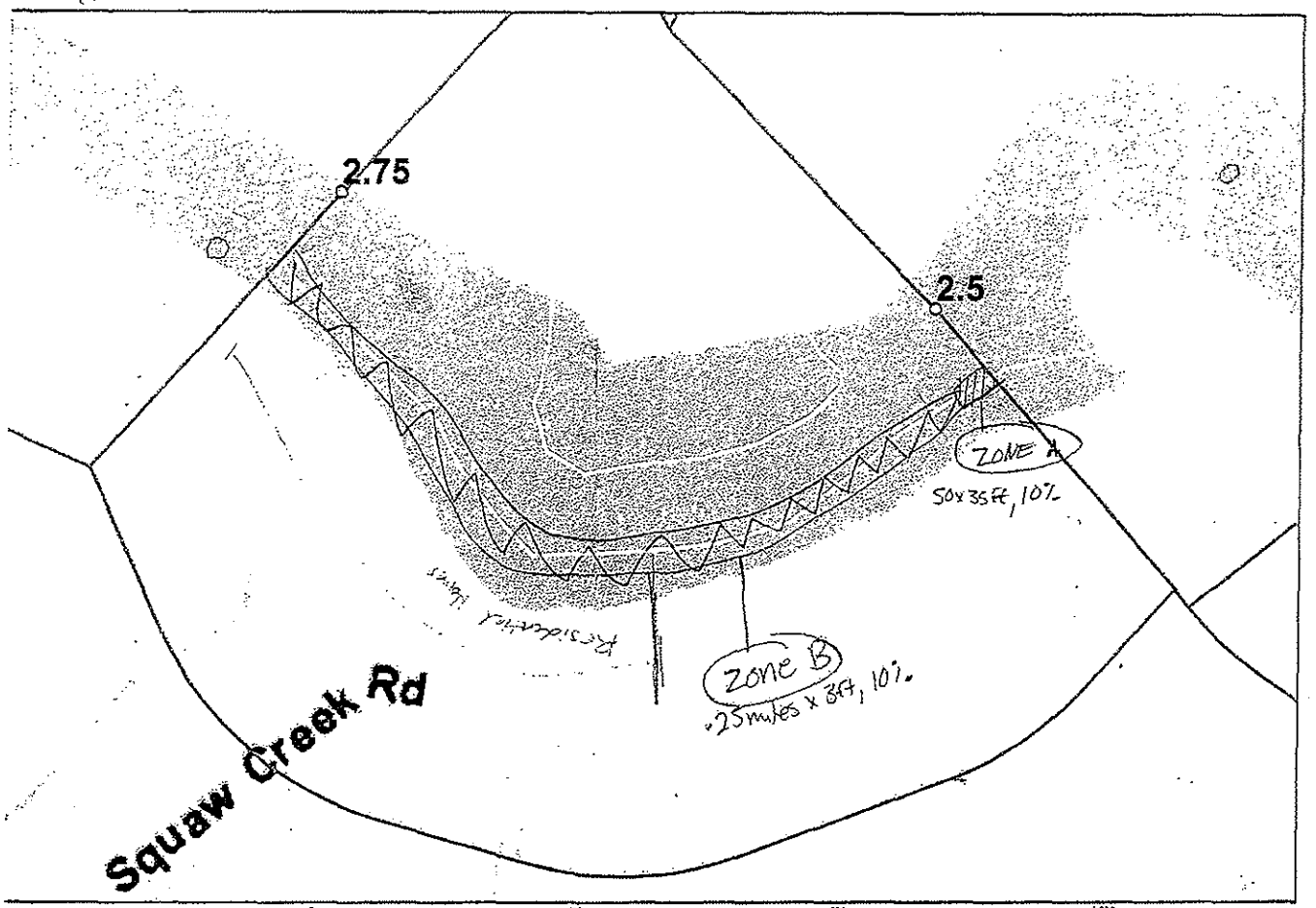
OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 2.5-2.75 Right Bank While Looking Downstream										
SCC1-2	Shoreline	Shoreline Assessment	•	•				42.25852	-85.00232	(Y) / N
SCC1-3	Shoreline	Shoreline Assessment	•		•			42.25860	-85.00248	(Y) / N
EPA-C-0206	Main Channel	SCAT T2 8/27/2010	Refer to Kalamazoo River/Embridge Spill Cleanup Recommendation Methods					42.25902	-85.00217	(Y) / N
EPA-C-0207	Main Channel	SCAT T2 8/27/2010	Refer to Kalamazoo River/Embridge Spill Cleanup Recommendation Methods					42.259183	-85.00495	(Y) / N
EPA-C-0208	Shoreline/ Overbank	SCAT T2 8/27/2010	natural attenuation small (12-18" dia),sporadic (4-5) localized deposits on shoreline fringe just downstream of small island					42.258252	-85.00268	(Y) / N
EPA-C-0209	Shoreline/ Overbank	SCAT T2 8/27/2010	pools and liquid petroleum in need of removal island in the river, pooled oil remains. vacuum pools within root zones, cut stained veg but leave root. remove oiled debris from log mass on east side of island, remove oil overhang veg					42.25866	-85.00207	(Y) / N
EPA-C-0210	Main Channel	SCAT T2 8/27/2010	Refer to Kalamazoo River/Embridge Spill Cleanup Recommendation Methods					42.258553	-85.00488	(Y) / N
EPA-C-0243	Shoreline	SCAT T1 8/22/10	Coated grassy areas with a little pooling; near lawn. Adjacent to MP2.75. Rec: Remove mottled vegetation, absorb pooled spots. (WP 12)					42.25915	-85.00488	(Y) / N

Printed Team Members Name: WILLIAM BATES
Date: 9/15/10
Comments:

Saturated soil by fallen tree near upstream end of island, just west of fallen tree marked with dike and flag
WP52 N 42.25861 W 85.00229 WP53 N 42.25870 W 85.00294 - saturated soil, following drainline

EPA-C-397 SCAT T2 (8/28) Note: disturbed sediment resulted in obvious sheen on water surface 42.259 -85.001 (Y) / N
EPA-C-398 SCAT T2 (8/28) Note: disturbed sediment resulted in obvious sheen on water surface 42.2592 -85.005 (Y) / N
EPA-C-399 SCAT T2 (8/28) Note: disturbed sediment resulted in obvious sheen on water surface Small 12-18 diameter sporadic 4 to 5 local deposits on shoreline fringe, just downstream of small island. 42.258 -85.003 (Y) / N
EPA -C-0400 SCAT T2 (8/28) Note: disturbed sediment resulted in obvious sheen on water surface and island in river, partially cleaned but pooled oil remains, vacuum pools within root zones, cut stained veg, leave root masses, remove oile debris from log mass on east side of island, remove overhanging veg on north of island. 42.258 -85.002 (Y) / N
EPA-C-0401 SCAT T2 (8/28) Note: disturbed sediment resulted in obvious sheen on water surface and submerged pom poms need to be removed. 42.258 -85.005 (Y) / N



DLINES

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 65

ENTRIX
Down to Earth. Down to Business.
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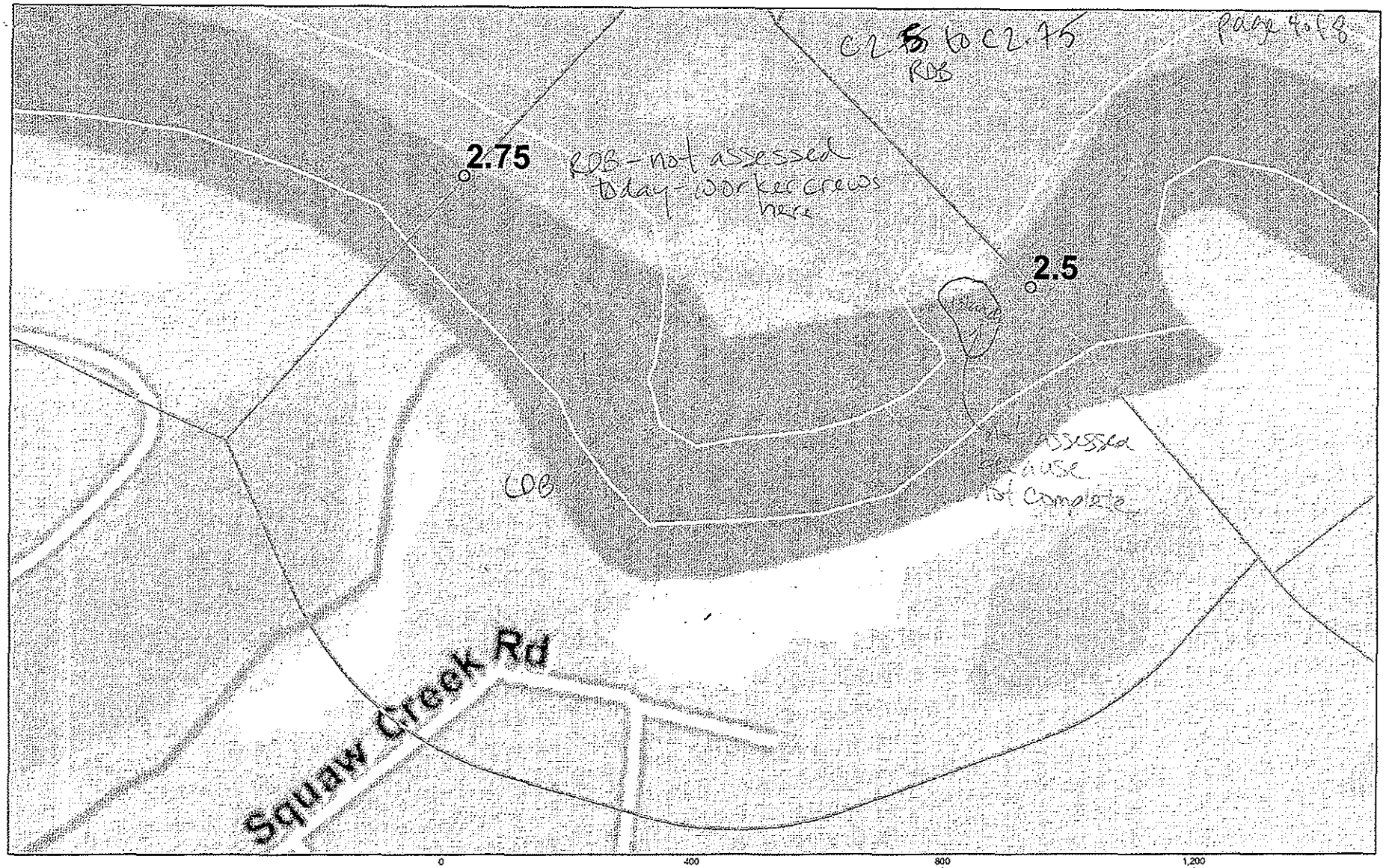
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Division C: Mile Marker 2.5 - 2.75 Left Bank while looking downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 2.5-2.75 Right Bank While Looking Downstream									
SCC1-2	Shoreline	Shoreline Assessment	•	•				42.25852	-85.00232
SCC1-3	Shoreline	Shoreline Assessment	•		•			42.25860	-85.00248
EPA-C-0206	Main Channel	SCAT T2 8/27/2010	Refer to Kalamazoo River/Embridge Spill Cleanup Recommendation Methods					42.25902	-85.00217
EPA-C-0207	Main Channel	SCAT T2 8/27/2010	Refer to Kalamazoo River/Embridge Spill Cleanup Recommendation Methods					42.259183	-85.00495
EPA-C-0208	Shoreline/ Overbank	SCAT T2 8/27/2010	natural attenuation small (12-18" dia),sporadic (4-5) localized deposits on shoreline fringe just downstream of small island					42.258252	-85.00268
EPA-C-0209	Shoreline/ Overbank	SCAT T2 8/27/2010	pools and liquid petroleum in need of removal island in the river, pooled oil remains. vacuum pools within root zones, cut stained veg but leave root. remove oiled debris from log mass on east side of island, remove oil overhang veg					42.25866	-85.00207
EPA-C-0210	Main Channel	SCAT T2 8/27/2010	Refer to Kalamazoo River/Embridge Spill Cleanup Recommendation Methods					42.258553	-85.00488



DIVISION GRIDLINES

SHORELINE

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

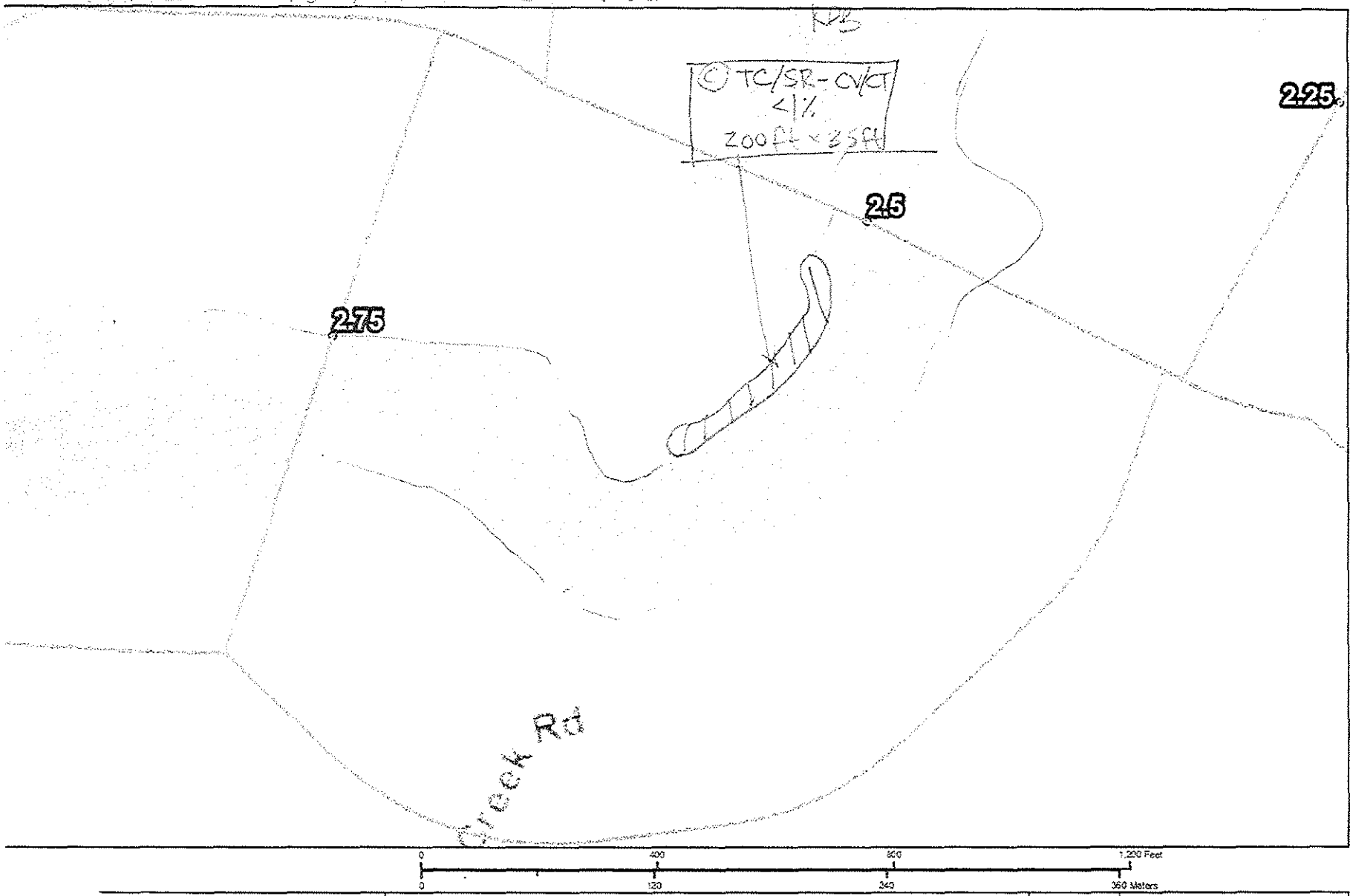
Image: 2009 NAIP

SHEET #: 05

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Division C: Mile Marker 2.5 - 2.75 Right Bank while looking downstream



SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

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Division C: Mile Marker 2.5 - 2.75 Right Bank while looking downstream

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/12/10 Time: AM / (PM)

Operations Division: C Segment ID: From 2.5 Start MP to End MP 2.75 Segment Length: 0.25 mile

Bank (LDB) / (RDB) ☒ Island Overbank: (LOB) (ROB)

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: ELMER Guy Tower

Division Supervisor(Contractor): Doug Blankenship

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/2/10 **Time: AM / PM**

Operations Division: 2 **Segment ID: From** 2.5 **Start MP to End MP** 2.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Charles Strickland

Division Supervisor(Contractor): Wade Hanaway

SCAT Reviewed – Description of Clean Up Required

Recomadations were flushing, Removal of oiled vegetation & Debris. Vacuum pooled oil in roots

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

pooled oil Removed, Debris & oiled vegetation Removed, Roots planted

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 2.5-2.75 Left Bank While Looking Downstream										
SCC1-4	Shoreline	Shoreline Assessment					1 oiled residential dock	42.25795	-85.00343	(Y) / N
SCC1-5	Shoreline	Shoreline Assessment			•		2 oiled residential docks	42.25778	-85.00367	(Y) / N
SCC1-27	Shoreline	Shoreline Assessment	•		•	•	Mechanical?	42.25832	-85.00483	(Y) / N

Printed Team Members Name: WILLIAM BATES
Date: 9/15/10
Comments:

N42.25865 > WP54 saturated sediment
W85.00513

Entire left bank is zone B, staining along shoreline, tar coated / stained of overhanging veg, recommended trim overhanging stained vegetation, as well as impacted mottled vegetation.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 2.5 to MP 2.75 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature DAVE WOOLEY (date) 9/14/2010 Enbridge

Signature Eduardo Rovira (date) 9/14/10 EPA

4. **SCAT Reassessment**

Signature (date) 9/15/10 Enbridge

Signature WILLIAM BATES (date) 9/15/10 EPA

Signature Christopher Clampitt (date) 9/15/10 MDNRE

5. **EPA**

Signature (date) 9/21/10 EPA Division Supervisor

Inspected 9/21/10. Perform daily maintenance of LDB where clearing occurred. Also check inland of small peninsula (RDB) (where the 2.5 RDB stake is positioned) CW. 9/21/10.

Appendix E
Photographs



Photo 0403 – Looking northwest at right descending bank.



Photo 0404 – Looking northeast at right descending bank.



Photo 0405 – Looking northwest at right descending bank, near SCC1-3.



Photo 0406 – Looking south at right descending bank.



Photo 0407 – Looking southwest at right descending bank.



Photo 0408 – Looking southwest at right descending bank.



Photo 0409 – Looking east at right descending bank.



Photo 0410 – Looking southeast at right descending bank.



Photo 0411 – Looking north at right descending bank.



Photo 0452 – Looking east at right descending bank, near EPA-C-0210.



Photo 0453 – Looking southeast at left descending bank, near SCC1-27.



Photo 0454 – Looking east at left descending bank.

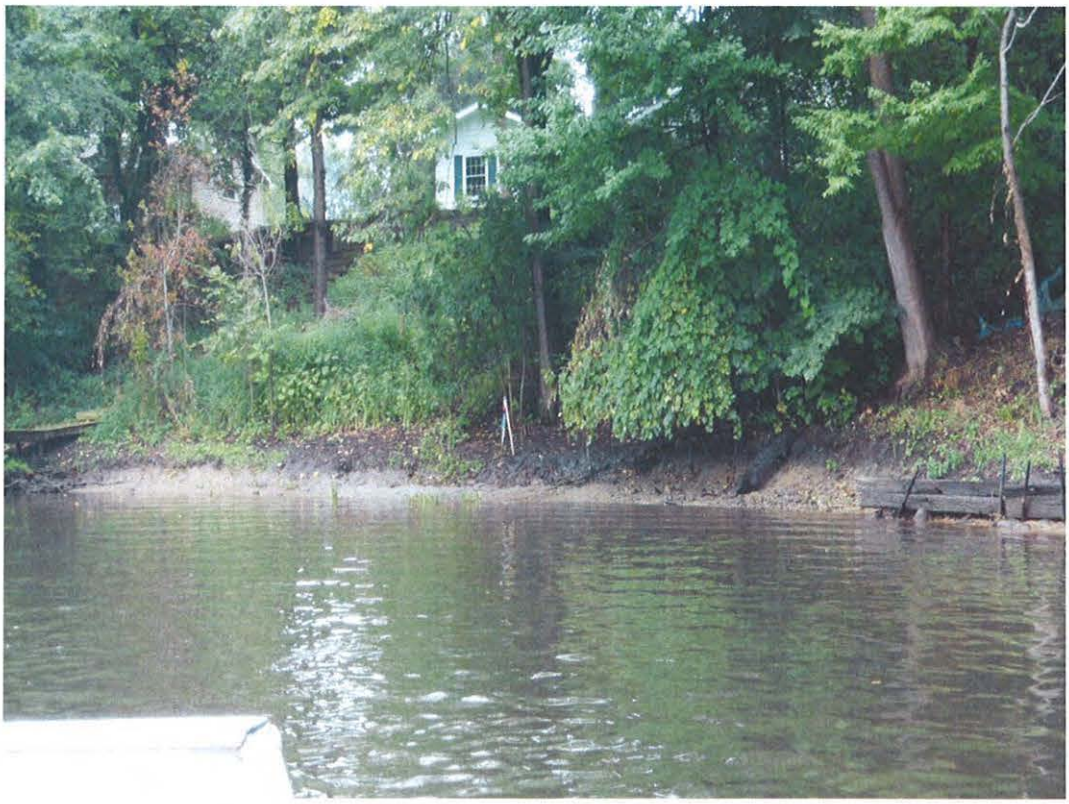


Photo 0455– Looking south at left descending bank, near SCC1-5.



Photo 0456 – Looking southwest at left descending bank.



Photo 0457 – Looking southeast at left descending bank.



Photo 0458 – Looking southeast at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 3.00 – MP 2.75 to 3.00

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 3.00 had moderate oiling, stained rip-rap, oiled vegetation and oiled debris on the left descending bank. Two islands were present but were not checked in the original SCAT report. Very light oiling was observed on the right descending bank and the overbank contained no areas requiring clean-up.

Actions

Free oil was recovered from along the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 3.00 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- High volume low pressure flushing for free oil removal with downstream booming, absorbent booms and pads;
- Removal of oiled debris;
- High pressure flushing of man-made structures and/or rocks;
- Mechanical removal of aquatic vegetation.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along the left descending bank near MP 2.75 and EPA-C-0258 and along the east side of the upstream island;
- Oiled woody vegetation along the left descending bank near MP 2.75, EPA-C-0258, EPA-C-0254, EPA-C-0267 and on the island.

Segment 3.00 reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

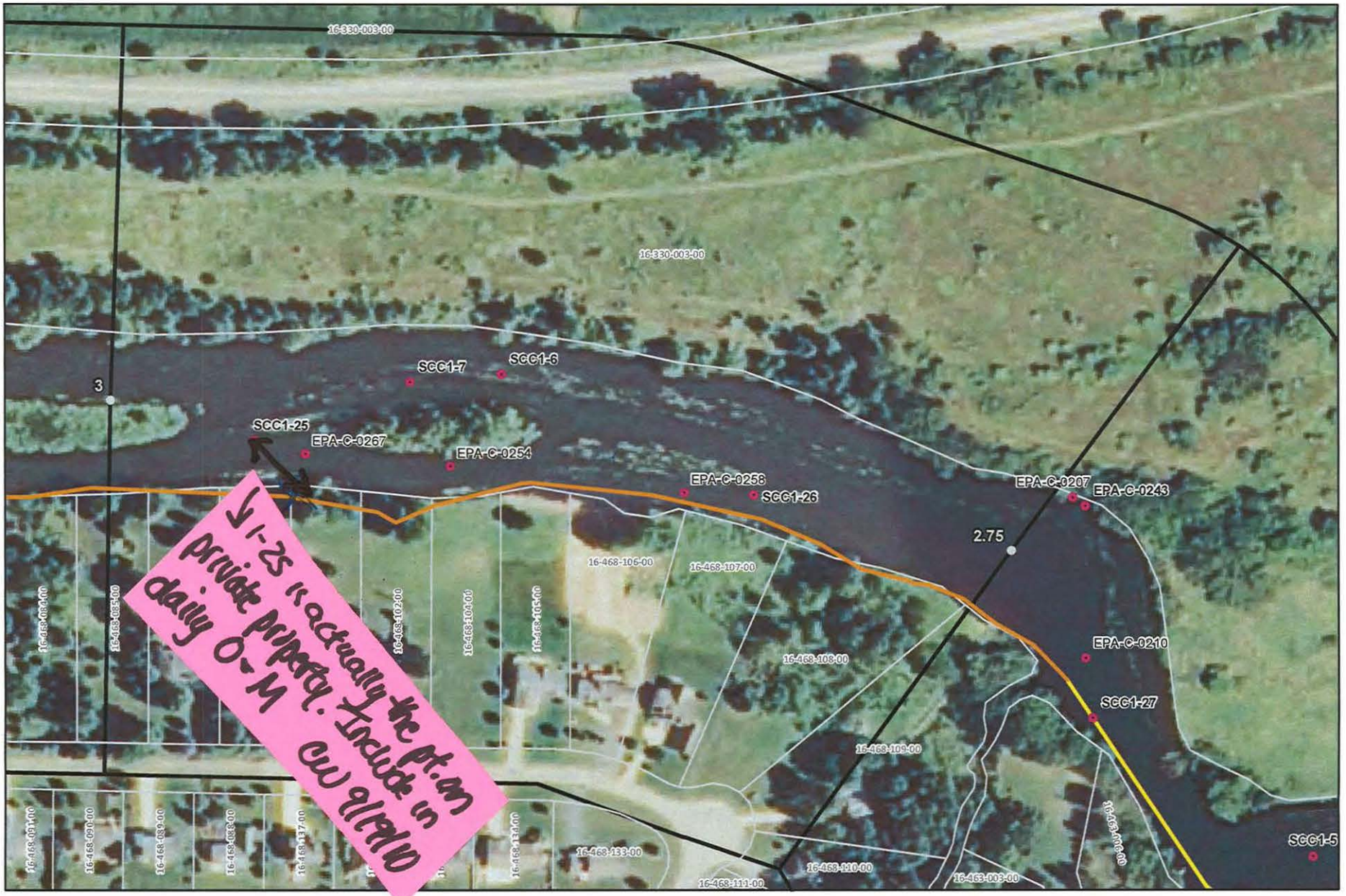
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 2.75-3 Left Bank While Looking Downstream									
SCC1-25	Shoreline	Shoreline Assessment				•	Follow-up Needed	42.25938	-85.00927
SCC1-26	Shoreline	Shoreline Assessment	•	•	•			42.25918	-85.00663
SCC1-7	Shoreline	Shoreline Assessment	•	•				42.25962	-85.00845
EPA-C-0243	Shoreline	SCAT T1 8/22/10	Coated grassy areas with a little pooling; near lawn. Adjacent to MP2.75. Rec: Remove mottled vegetation, absorb pooled spots. (WP 12)					42.25915	-85.00488
EPA-C-0244	Shoreline	SCAT T1 8/22/10	Stained/coated riprap in front of residential area (WP 16). Recommend power wash stained rocks.					42.25995	-85.01280

A -





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 2.75-3
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

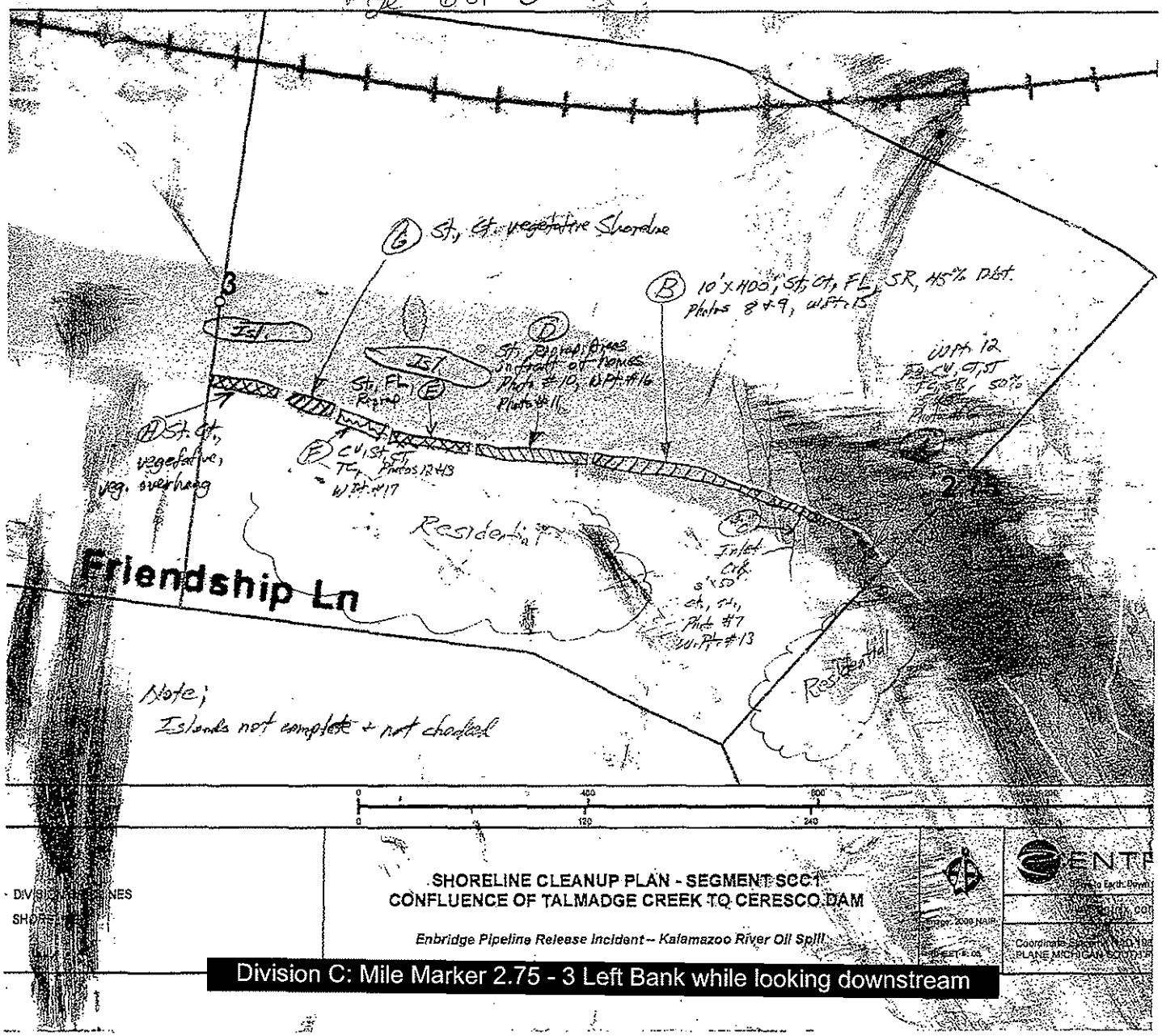
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

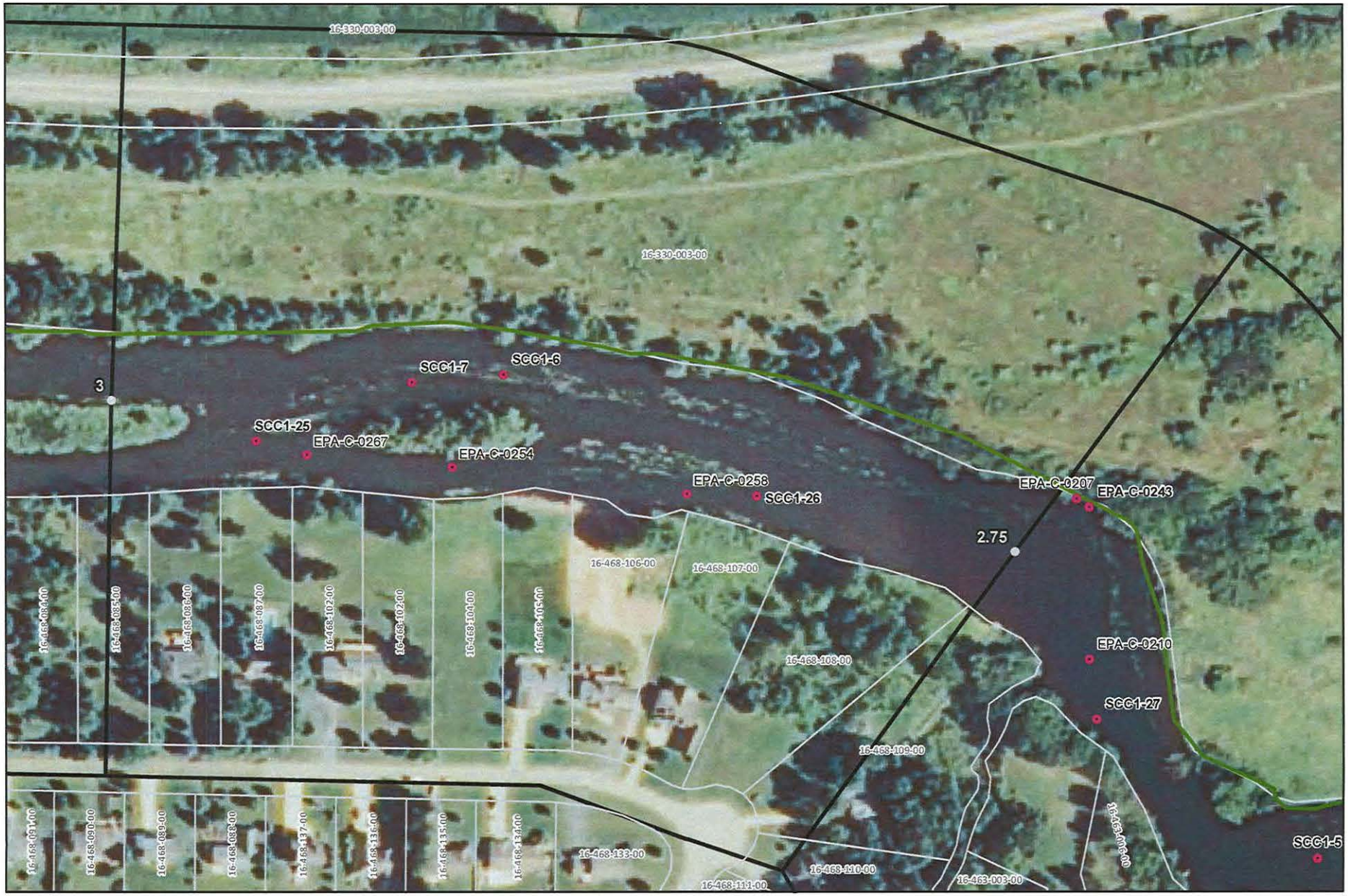
Coordinate System: NAD 1983 State Plane Michigan South Feet



Division C: Mile Marker 2.75 - 3 Left Bank while looking downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 2.75-3 Right Bank While Looking Downstream									
SCC1-6	Shoreline	Shoreline Assessment					No cleanup required.	42.25965	-85.00797





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 2.75-3
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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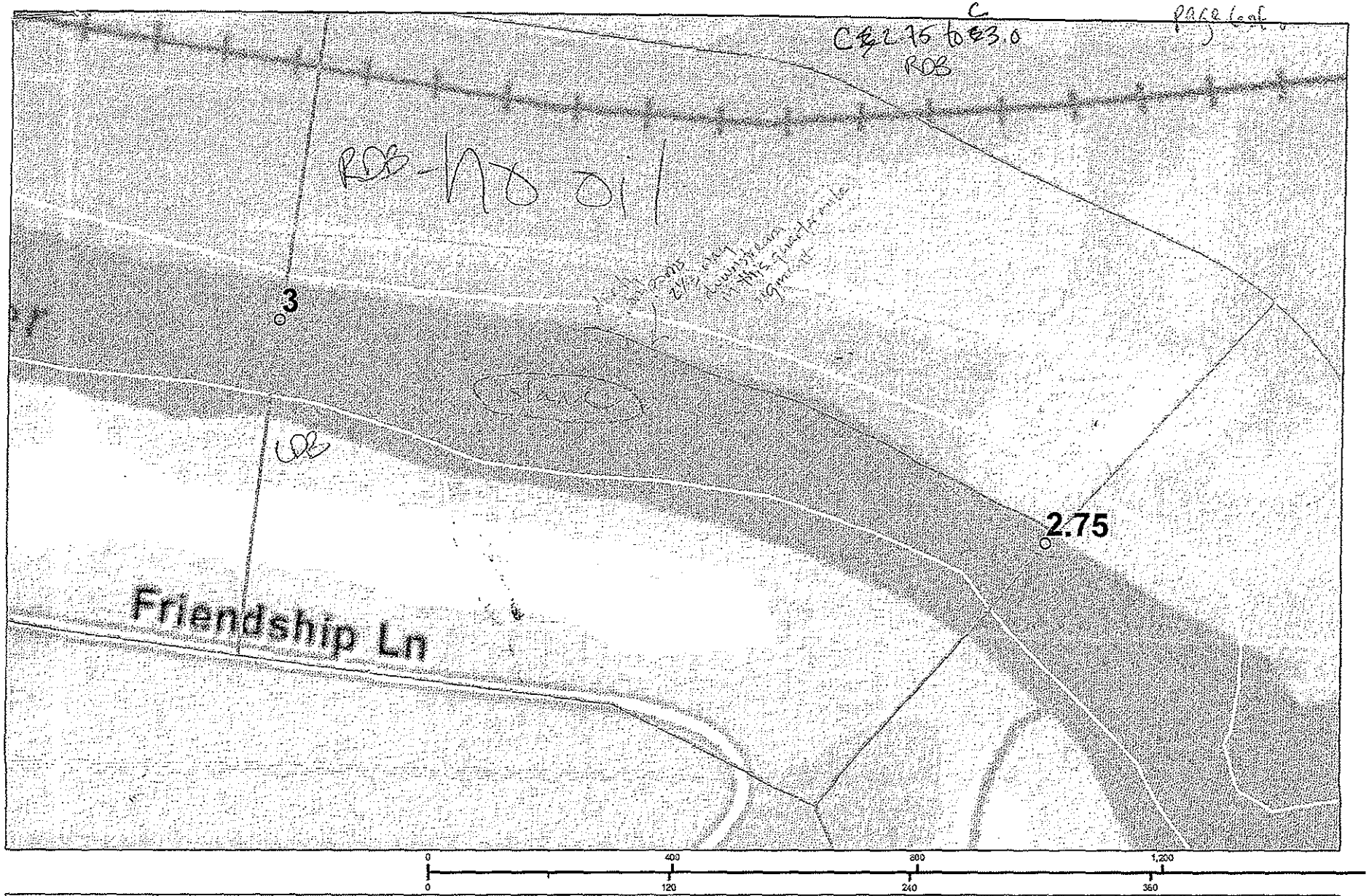
Coordinate System: NAD 1983 State Plane Michigan South Feet



DIVISION GRIDLINES

SHORELINE

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 05

ENTRIX
Down to Earth. Down to Business.

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Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Division C: Mile Marker 2.75 - 3 Right Bank while looking downstream

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
CRAFT INSPECTION REPORT (CIR)

Date: 9/10/10 Time: AM / PM

Operations Division: C Segment ID: From 2.75 Start MP to End MP 3.0 Segment Length: 0.25 mile

Bank: LDB / RDB ☒ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector: Ben Frings

Division Supervisor(Contractor): JOSHUA DEARTES

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Revised9/01/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/10/10 **Time: AM / PM**

Operations Division: 2 **Segment ID: From** 2.75 **Start MP to End MP** 3.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ NR

Field Inspection Team

Enbridge Inspector: Charles Strickland

Division Supervisor(Contractor): Dale Hennessy

SCAT Reviewed – Description of Clean Up Required

Recommendations were to flush Shoreline, Removal of Pooled oil. Power wash Stained Rocks in Residential area. Removal of oily veg. & Debris

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Shoreline flushing, Removal of oily vegetation & Debris. Zip loop in Residential Section was pressure washed

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 2.75-3 Left Bank While Looking Downstream										
SCC1-25	Shoreline	Shoreline Assessment				•	Follow-up Needed	42.25938	-85.00927	Y / N
SCC1-26	Shoreline	Shoreline Assessment	•	•	•			42.25918	-85.00663	Y / N
SCC1-7	Shoreline	Shoreline Assessment	•	•				42.25962	-85.00845	Y / N

Printed Team Members Name: WILLIAM BATES
Date: 9/15/10
Comments:

N42.25938 W85.01006 WP 56 sheen under roots, upstream island has saturated soil WP57 N42-25946 W85.00838 N42.25937 W85.00822 WP58 60'x15' saturated soil near EPA-C-025

Note: EPA-C-0244 is located on the right bank of segment 3.25, will be reviewed as such
Entire Left Bank (please refer to map), no points indicated on map
Zone A -coated grassy area with a little pooling near lawn adjacent to MP 2.75, recommend remove matted veg, absorb pooled spots. Y / N
Zone B- filmed sheen sun coated shoreline, veg has been cut, some biological sheen, recommendations to remove vegetation Y / N
Zone C-stained coated inlet creek, recommendation remove impacted vegetation do not trample disturbed creek bed (erosion) Y/N
Zone D - stained coated rip rap in front of residential area power wash stained rock Y / N
Zone E- stained rip rap , power wash Y / N
Zone F - stained coated tar filmed covered areas, remove tar and debris Y / N
Zone G - stained, coated, filmed in water as well as over hanging vegetation, no recommendations Y / N
EPA-C-0254 SCAT T2 (8/15) hot spot where ground and vegatation is covered in oil, refer to Kalamazoo Enbridge Cleanup recommendations 42.259 -85.008
EPA-C-0258 SCAT T2 (8/15) Coated ground and vegetation, refer to Kalamazoo Enbridge Cleanup Recommendations 42.259 -85.007 Y / N
EPA-C-267 SCAT T2 (8/15) Coated ground and vegetation, Refer to Kalamazoo Enbridge Cleanup Recommendations 42.259 -85.009 Y / N
EPA-C-0364 SCAT T3 (8/28) This point is on an island, replace pom poms and add absorbent pads down river towards end of segment 42.2594 -85.0081 Y / N
EPA-C-0365 SCAT T3 (8/28) Mousse like substance between booms on north side of island, Zone A is the shorline 10' in, woody veg has already been cut, cut grassy veg as low as possible, leaving roots intact 42.2594 -85.0099

WP59 N42.25974 W85.00828 10'x30' saturated soil on right side of upstream island

WP60 N42.25925 W85.00923 saturated to tarred soil 55'x20'

WP61 N42.25882 W85.00567 15'x3' saturated soil

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 2.75-3 Right Bank While Looking Downstream										
SCC1-6	Shoreline	Shoreline Assessment					No cleanup required.	42.25965	-85.00797	(Y) / N

Printed Team Members Name: Bill Bates, Christopher Clampitt
Date: 9/15/10
Comments:

No oil on this bank, no recommendations

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 2.75 to MP 3.0 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature DAVE HOOKER	9/14/2010 (date)	Enbridge
Signature Eduardo Rovira	9/14/10 (date)	EPA

Eduardo Rovira

4. **SCAT Reassessment**

Signature	9/15/10 (date)	Enbridge
Signature WILLIAM BATES	9/15 (date)	EPA
Signature Christopher Clampitt	9/15/10 (date)	MDNRE

5. **EPA**

Signature 9/19/12 (date) EPA Division Supervisor

SSC 1-25 is actually on private property. This area requires padding and needs to remain on daily O-M.

Appendix E
Photographs



Photo 0412 – Looking west at right descending bank.



Photo 0413 – Looking west at right descending bank.



Photo 0414 – Looking west at right descending bank.



Photo 0415 – Looking northeast at island, near SCC1-7.



Photo 0416 – Looking west at island, near EPA-C-0244.



Photo 0417 – Looking west at right descending bank.



Photo 0418 – Looking west at right descending bank.



Photo 0446 – Looking east at left descending bank.

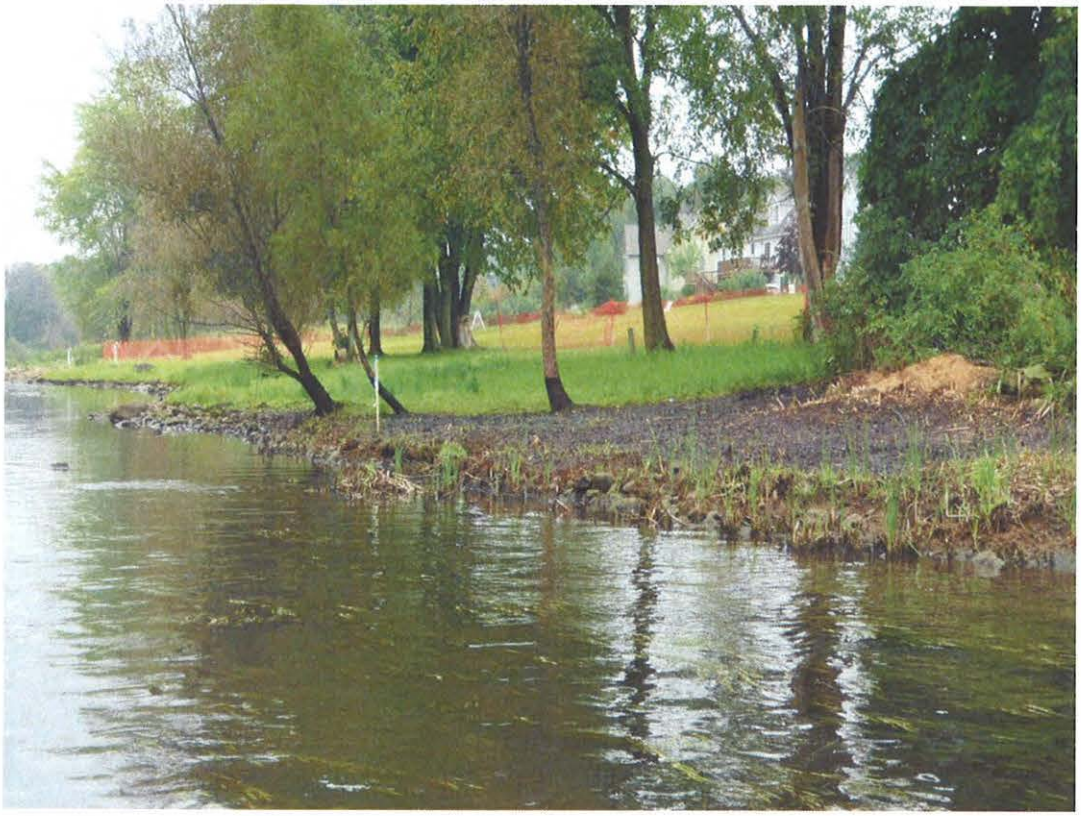


Photo 0447 – Looking southeast at left descending bank, near SCC1-25.



Photo 0448 – Looking southeast at left descending bank.



Photo 0449 – Looking east at left descending bank, near SCC1-26.



Photo 0450 – Looking east at left descending bank, near CD-3.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 3.25 – MP 3.00 to 3.25

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 3.25 had moderate oiling, oiled vegetation and stained rip-rap on the left descending bank. An island was present in the segment and contained areas of pooled oil. Very light oiling, tar balls, stained rip-rap and oiled debris were observed on the right descending bank. The right overbank contained an area of tar covered wetland vegetation and no areas of oil were observed on the left overbank.

Actions

Free oil was recovered from along the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 3.25 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs;
- High volume low pressure flushing for free oil removal with downstream booming, absorbent booms and pads;
- Removal of oiled debris;
- Mechanical removal of aquatic vegetation.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along left and right descending banks and right overbank in SCAT Zones B, C, D and E and in small areas on the island;
- Oiled woody vegetation on left descending bank in Zone C;

- Oiled herbaceous vegetation on right overbank in Zone E;
- Oiled rocks and cobble on the right descending bank in Zone B.

The island in this segment has the potential to require operation and maintenance. Recommended operation and maintenance is the installation of absorbents and booming strategy as necessary due to sheen potential.

Segment 3.25 reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**

Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 3-3.25 Left Bank While Looking Downstream									
* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 3-3.25
Left Bank While Looking Downstream

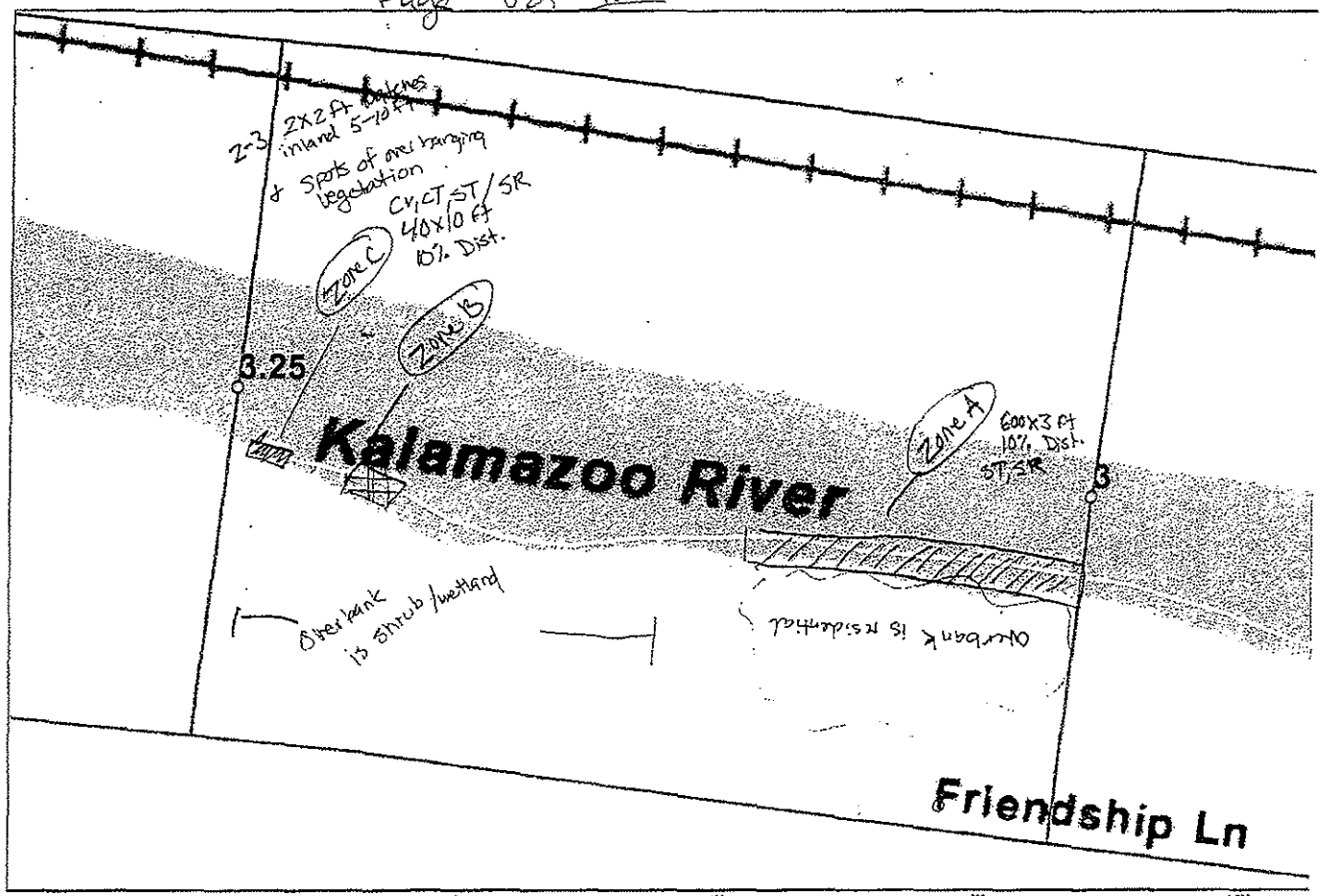
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Division C: Mile Marker 3 - 3.25 Left Bank while looking downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 3-3.25 Right Bank While Looking Downstream									
SCC1-8	Shoreline	Shoreline Assessment	•	•				42.25960	-85.01123





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 3-3.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/12/10 Time: AM / (PM)

Operations Division: C Segment ID: From 3.0 Start MP to End MP 3.25 Segment Length: 0.25 mile

Bank: (LDB) / (RDB) ☒ Island Overbank (LOB)/(ROB)

Weather: (Sun)/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: ELMER GUY TOWNER

Division Supervisor(Contractor): Doug Blackmore

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

clean up completed

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/1/10 Time: AM / (PM)

Operations Division: 2 Segment ID: From 3.0 Start MP to End MP 3.25 Segment Length: 0.25 mile

Bank: (LDB) (RDB) ☑ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Charles Strickland

Division Supervisor(Contractor): Wade Hanavan

SCAT Reviewed – Description of Clean Up Required

Recommendations are to Remove pooled oil, Bank flushing Removal of overhanging Branches & veg Cutting

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Pooled oil has been removed, Shore line flushing Removal of oiled vegetation, and cut & trapped overhanging Branches, Island flushing

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 3-3.25 Left Bank While Looking Downstream										
EPA-C-0262 SCAT T2 (8/15) Cutting of herb and cleaning of debris, containment boom downstream of cutting, coated tree trunk 42.2594 -85.0136 Y / N Please refer to attached map for zone locations, go coordinates available Zone A - rip rap along shore line has some staining, no recommendation (y) / N Zone B- Recommend removing dead and matted vegetation and impacted standing vegetation within a 10' boundry (Y) / N Zone C- Recommend trimming impacted overhanging vegetation and impacted standing and matted vegetation from the small patches 5-10' from shore (Y) / N										
→ not high in hill-find using GPS coord										
		Team 3 9/15/10								
		Amanda Schmidt								
		Katie Forch								
		Beau Del Rosario								

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 3-3.25 Right Bank While Looking Downstream										
SCC1-8	Shoreline	Shoreline Assessment	•	•	ON ISLAND			42.25960	-85.01123	Y / N
EPA-C-0244	Shoreline	SCAT T1 8/22/10	Stained/coated riprap in front of residential area (WP 16). Recommend power wash stained rocks.					42.25995	-85.01280	Y / N

Printed Team Members Name:
Date:
Comments:

↳ no house w/ rip rap in front. but all rock looks good

Team 3 9/15/10
Amanda Schnorbusch
Ross Del Rosario
Kate Forchler

We think zone G on the map is supposed to be B?

wouldn't find flag but no issues along the shoreline

See attached map for zone locations, no coordinates at this time
Zone A- oiled debris on shoreline bank west of MP 3.0 need to remove oiled debris Y / N
Zone B- remove only oiled vegetation (grass) orange fence hindered over bank assessment Y / N
Zone C- pooled oil recommend absorbing pooled oil, and remove oiled veg, pooled oil next to orange fence Y / N - not flagged but we examined the shoreline & it looked good
Zone D- oiled veg / grass along the shoreline bank in patches of oil, remove. Overhanging veg until MP 3.25, remove oiled veg only Y / N
Zone E - oiled wetland veg in oxbow, oiled veg is patchy, sheen on water in canal, recommend natural attenuation, no removal Y / N

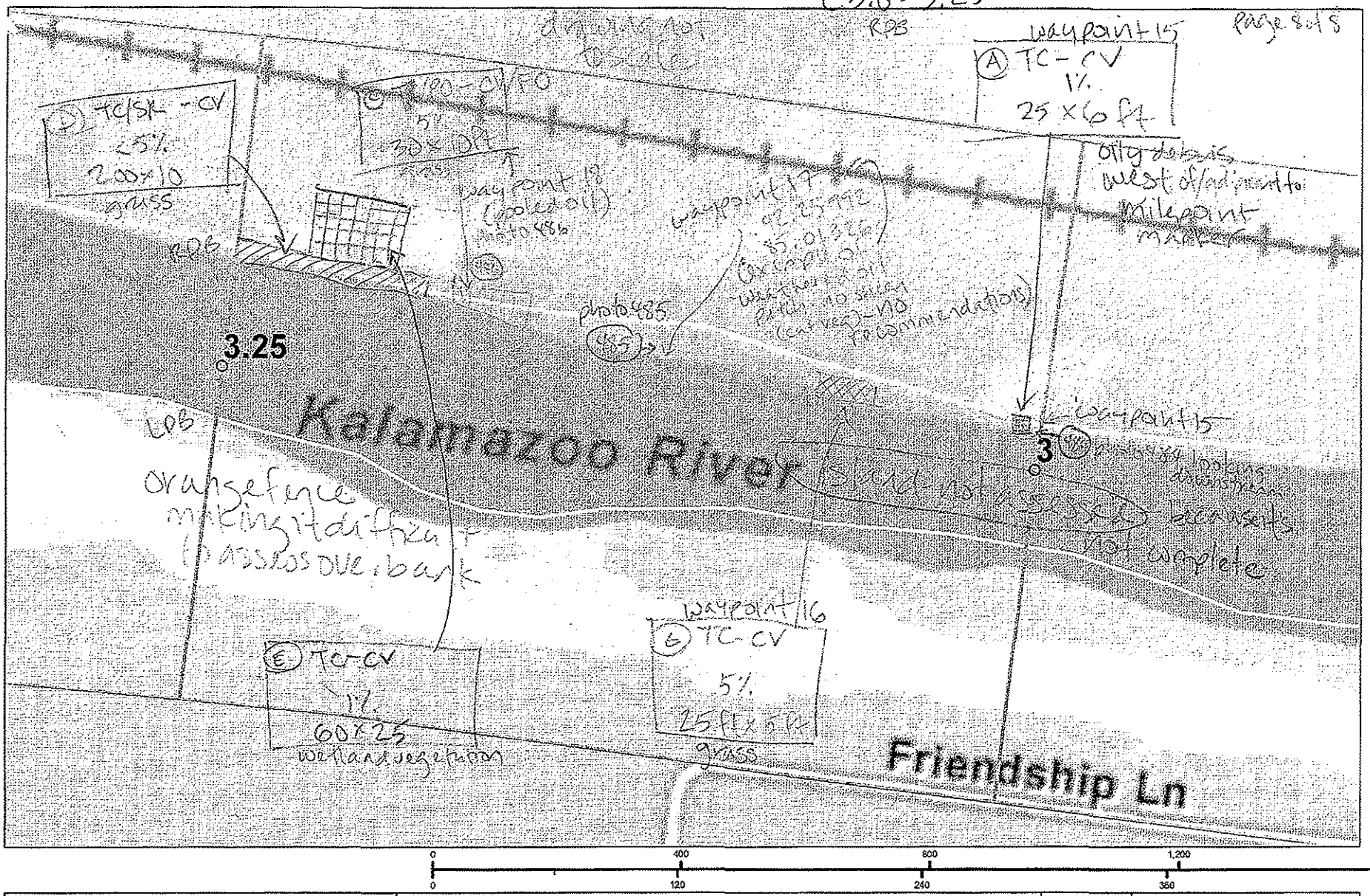
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 3 to 3.25 Island										
SCC1-8 No comment 42.26 -85.011 Y / N EPA-C-0366 SCAT T3 (8/28) Zone B is 10' in from shore in center of island, minimal impact to exsisting vegetation no recommendations at this time 42.259 -85.0102 Y / N EPA-C-0367 SCAT T3 (8/28) Sheen is present because we walked in water on the north side, tar balls were seen floating into absorbent booms on the north side, mousse like substance was seen on water netween the booms on the north side 42.259 -85.0114 Y / N Island Sketch depicts that Island was not assessed please re-asses and check above locations to verify consistancy										
- only one flag for EPA-C-0366										
- most of these rec. were not actual rec. we walked ~~the~~ island & had no issues										
SCAT satisfactory										

EPA-C-0365 - no info

Team 3 9/15/10
Amanda Bohnenblust
Ross Del Rosario
Katie Farchild

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation



DIVISION GRIDLINES

SHORELINE

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

ET #: 05

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Division C: Mile Marker 3 - 3.25 Right Bank while looking downstream

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 3.0 to MP 3.25 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature 9/14/2010 (date) Enbridge
DAVE HODEK

Signature Eduardo Rovira 9/14/10 (date) EPA
Eduardo Rovira

4. **SCAT Reassessment**

Signature 9/15/10 (date) Enbridge
Amanda Bohnenblust

Signature R. del Rosario 9/15/10 (date) EPA
ROSS DEL ROSARIO

Signature Kathleen R. Fairchild 9/15/10 (date) MDNRE
Kathleen R. Fairchild

5. **EPA**

Signature Christine Wagner 9/19/10 (date) EPA Division Supervisor

Include muskrat holes + area around large tree root in DAILY O+M plan. Sorbent/pom pom only - no additional excavation. CW

Appendix E
Photographs



Photo 0419 – Looking west at right descending bank.

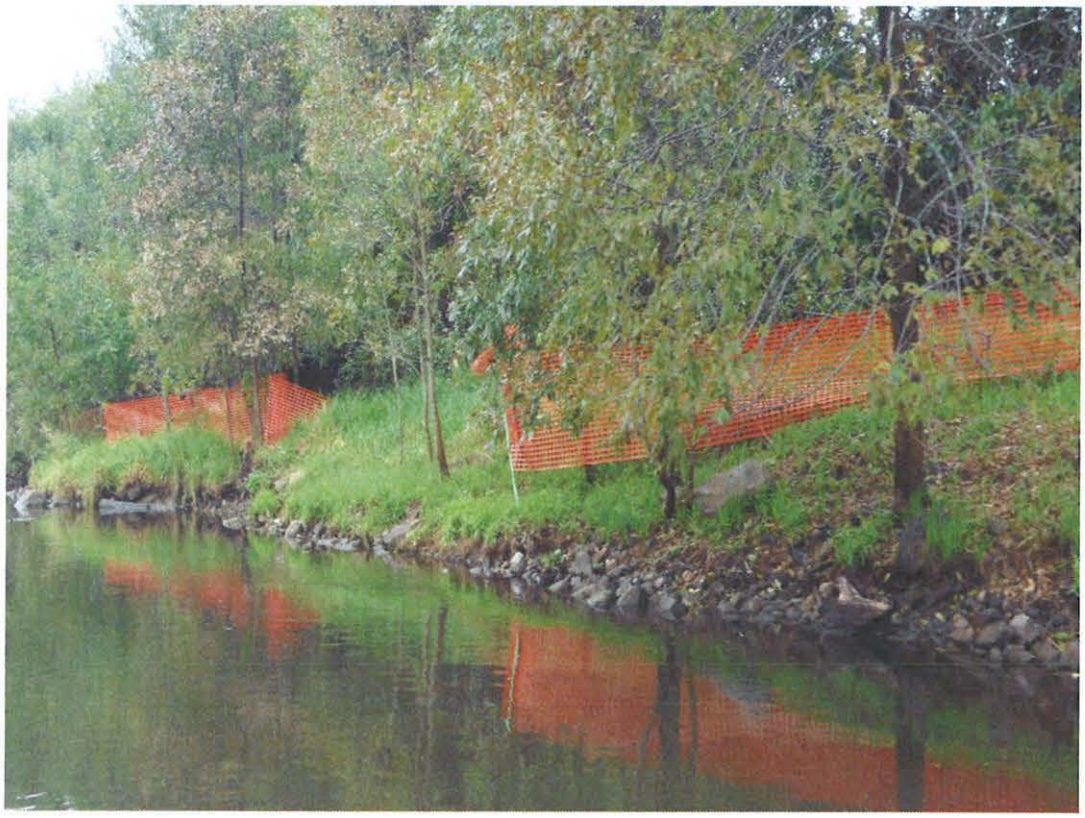


Photo 0420 – Looking northwest at right descending bank.



Photo 0421 – Looking west at right descending bank.



Photo 0422 – Looking west at right descending bank.



Photo 0423 – Looking north at right descending bank, near EPA-C-0244.



Photo 0424 – Looking west at right descending bank.



Photo 0425 – Looking north at right overbank.



Photo 0441 – Looking east at left descending bank

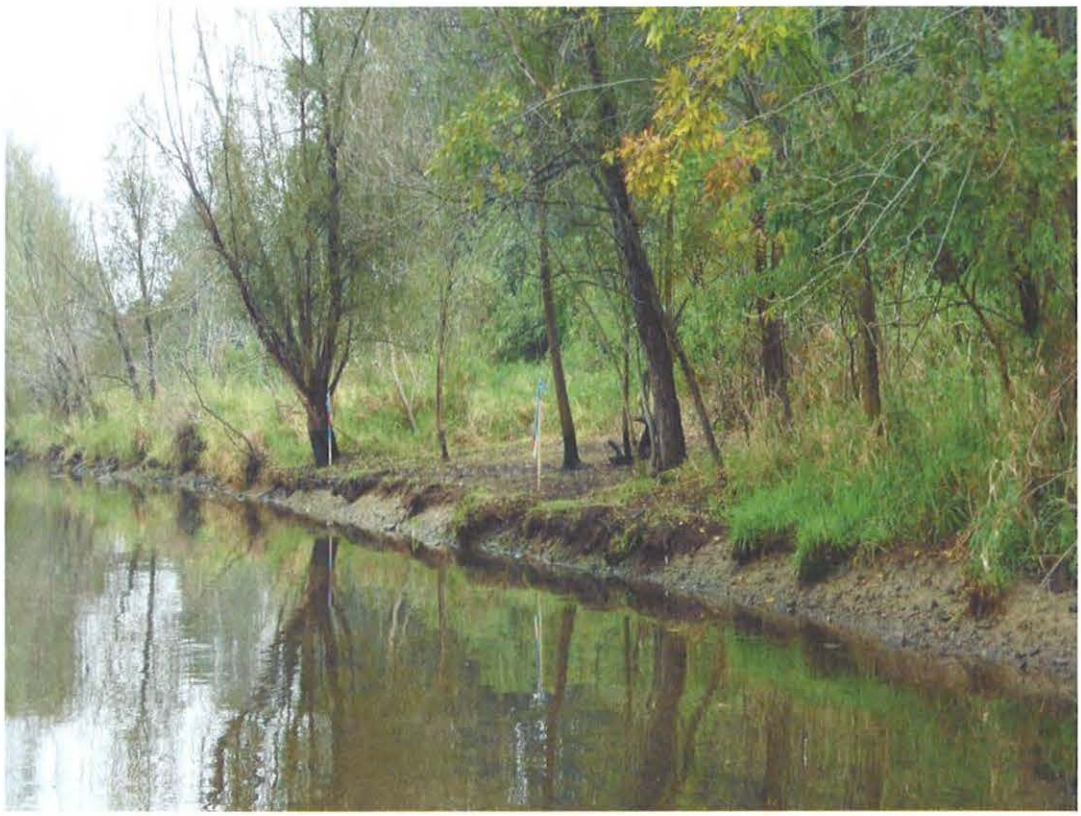


Photo 0442 – Looking southeast at left descending bank.



Photo 0443 – Looking east at left descending bank.

Field Photo Log – Segment 3.25



Photo 0444 – Looking east at left descending bank.



Photo 0445 – Looking east at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 3.50 – MP 3.25 to 3.50

Enbridge Energy

September 9, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment 3.5 had moderate levels of oiling on the left descending bank and very light oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oils from behind river flow obstructions. The free oil recovery consisted of low-pressure, high-volume water flushing with downstream capture by absorbent booming and absorbent pad collection. Once this was complete, a snare and sweep boom strategy was implemented along the shoreline to reduce seen from the river and assist in field identification where free oil recovery operations had been conducted. The shoreline clean-up activities within segment 3.5 consisted of the following:

- Free oil removal through flushing and absorption methods
- Vegetation removal along the shoreline leaving woody plants greater than 2 inches diameter width
- Removal of oiled limbs
- Removal of oiled debris
- High pressure flushing of rocks

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Stained soil along the left descending bank in SCAT assessment zones A and C
- Stained rocks along the left descending bank in SCAT assessment Zones A and C

Segment 3.5 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or irideocent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Outline of the 5-Step River Segment Clean-up Approval Process

Step 1: SCAT Segment Conditions Assessment

SCAT survey teams examine each 0.25 mi segment of the river to characterize shoreline and overbank types and the characteristics of oiling conditions. Observed oiling characteristics are captured in tabular form and on site sketch maps. See SCAT forms in Appendix A for specific recommendation details.

Step 2: Operations Clean-Up and Initial Inspection

Clean-up operations, recommended based on the Kalamazoo River/Enbridge Spill –Clean-up Recommendation Methods Table (Table 2) are conducted. After completion of clean-up, Enbridge Operational Inspectors (OIs) inspect for compliance with SCAT recommendations. An Operations Inspection Report (OIR) is generated to document this (Appendix B).

Segment results are then re-inspected by Enbridge Environmental Inspectors (EIs) to verify compliance with the SCAT recommendations. This inspection is summarized in the Segment Inspection Report (SIR) (Appendix B). As of September 3, 2010 it was agreed between the United States Environmental Protection Agency (USEPA) and Enbridge that EPA-sign off on the SIR document was not necessary. SIR documents created after this date will not contain a USEPA signature.

The Step 3: Site Inspection Sign Off

The segment is then given a field review and a signatory approval by Enbridge and United States Environmental Protection Agency (USEPA) representatives. This step does not generate any report. Signatory approval is shown on the Enbridge Spill SCAT Sign-Off Sheet (Appendix D).

Step 4: SCAT Reassessment

A SCAT reassessment team composed of Enbridge, United States Environmental Protection Agency (USEPA), and Michigan Department of Natural Resources and Environment (MDNRE) representatives will revisit the site and perform a post clean-up SCAT survey. The field form submitted from this survey is shown in Appendix C.

Step 5: SCAT Sign-Off Sheet

The site status and progress through the 5-Step Clean-up Approval Process is shown in Appendix D. Because the metrics outlined in the Response Plan for Downstream Impacted Areas are shown via multiple site inspections to have been met, Enbridge regards the clean-up of the river segment as complete.

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

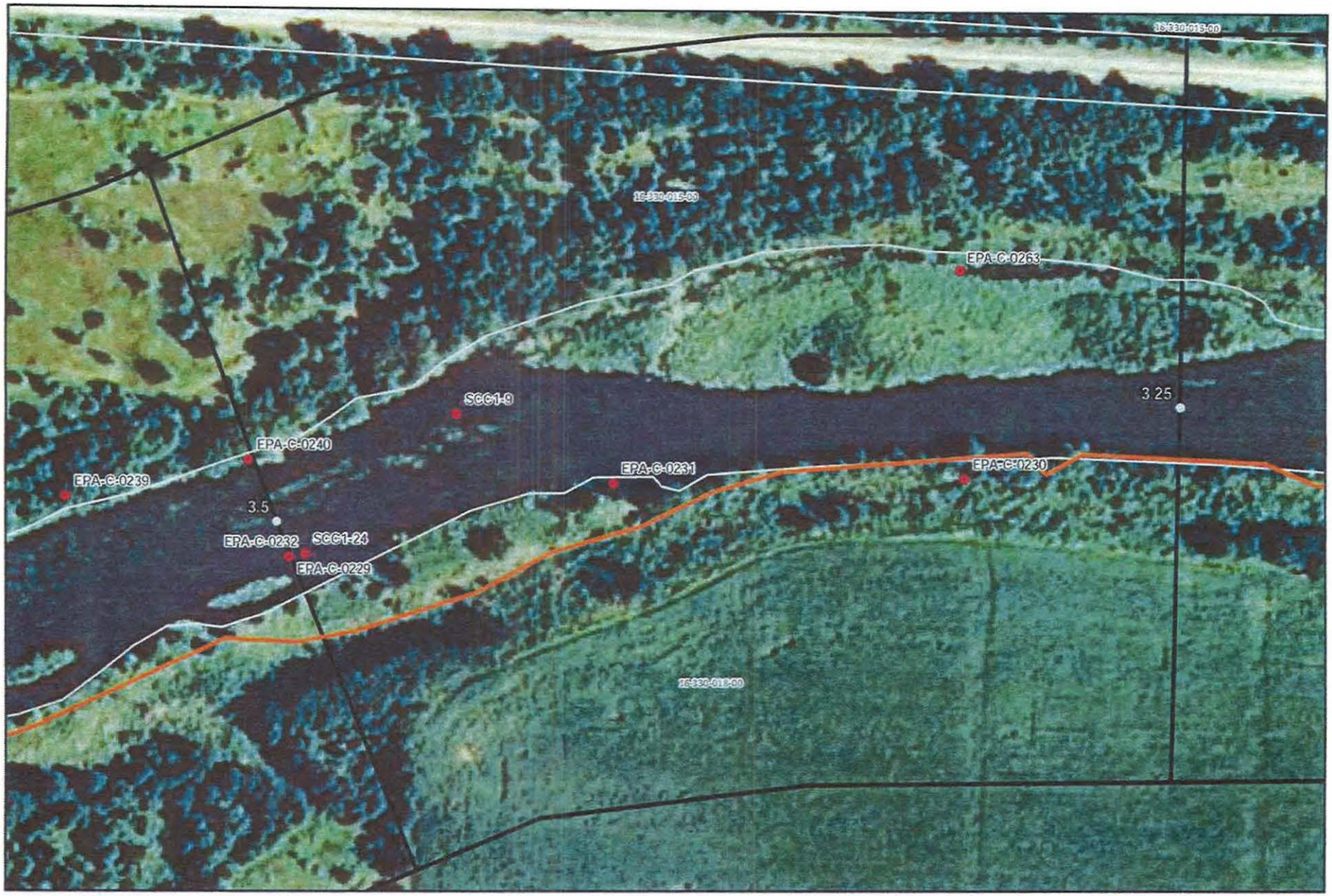
Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 3.25-3.5 Left Bank While Looking Downstream									
SCC1-24			•	•	•	•		42.25898	-85.01953
EPA-C-0229	Shoreline	SCAT T1 8/23/10	Do not remove oiled woody plants >2", remove oil w/ vacuum or absorption, manual oil removal - shovel, rags, pads, Recommend removing loose oiled vegetation on shoreline bank.					42.25897	-85.01962
EPA-C-0230	Shoreline	SCAT T1 8/23/10	Recommend removing oiled loose vegetation. Natural attenuation for rocks. Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil					42.25930	-85.01604
EPA-C-0231	Shoreline	SCAT T1 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Recommend removing oiled loose debris and scraping heavily oiled rocks.					42.25927	-85.01790
EPA-C-0232	Shoreline	SCAT T1 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Recommend maintaing asorbent pads and pom poms until sheen is gone.					42.25897	-85.01962





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 3.25-3.5
Left Bank While Looking Downstream

Enbridge ' 9 Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

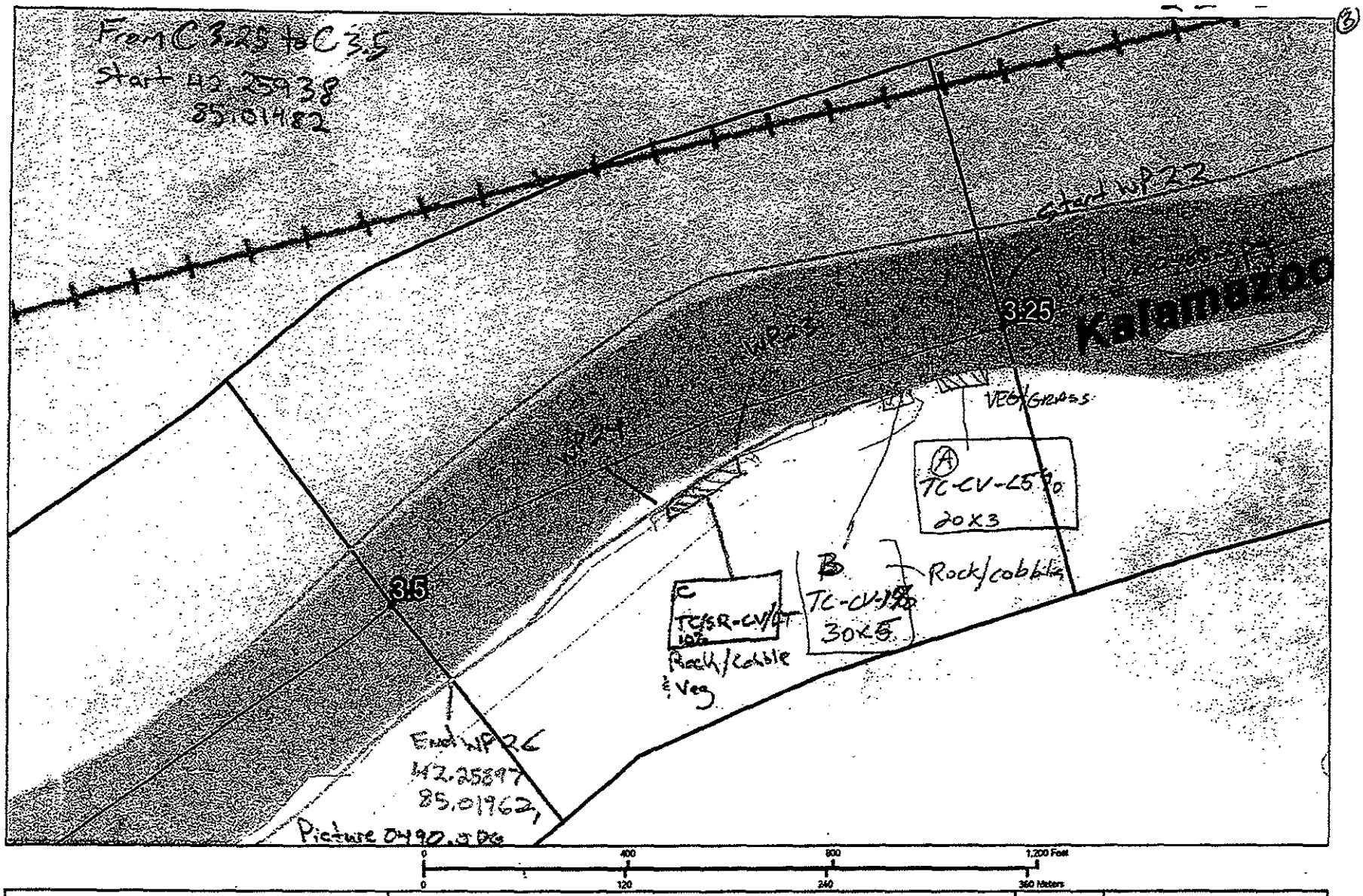
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coor Pla

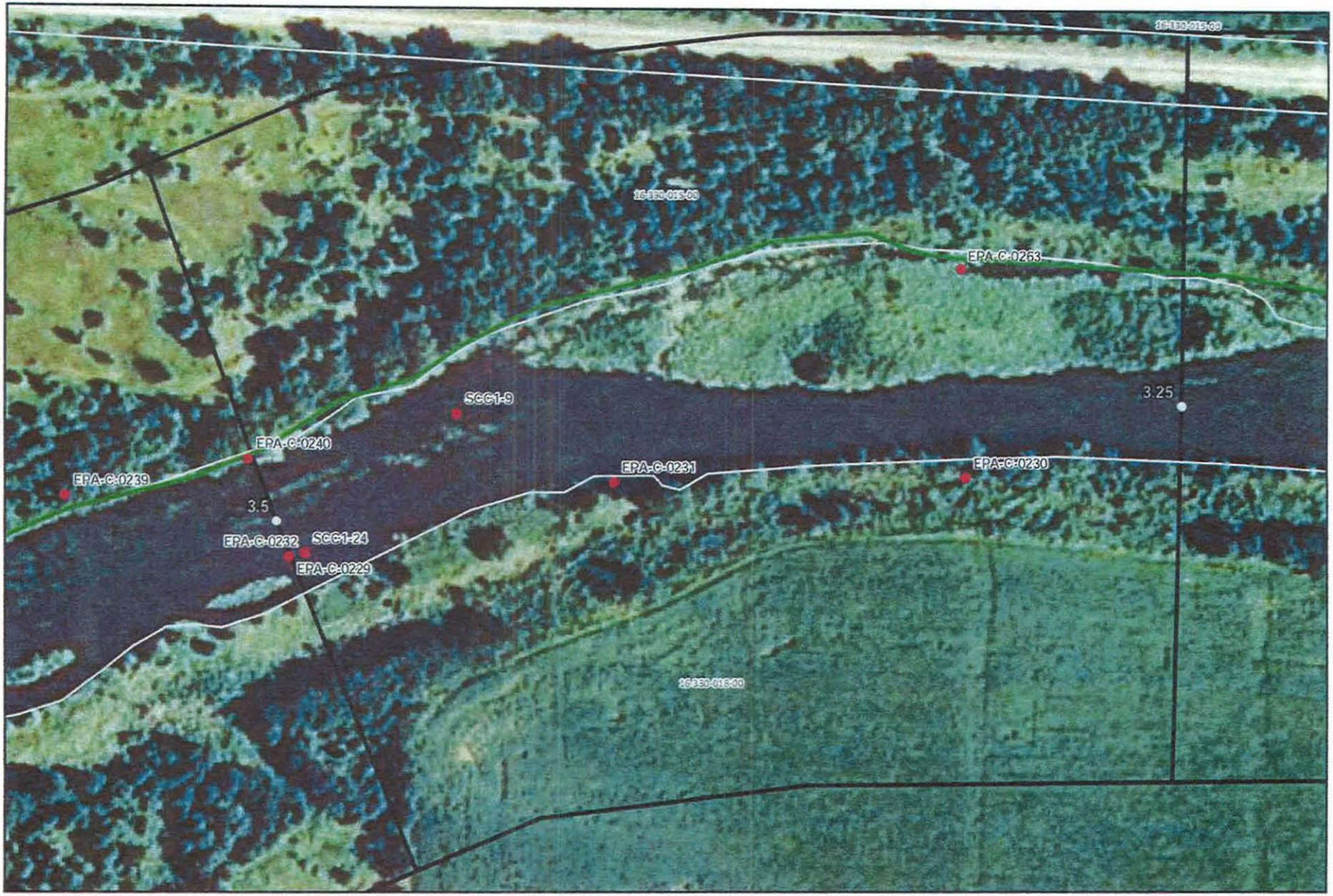
ystem: NAD 1983 State n South Feet



Division C: Mile Marker 3.25 - 3.5 Left Bank while looking downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 3.25-3.5 Right Bank While Looking Downstream									
SCC1-9	Shoreline	Shoreline Assessment	•	•				42.25953	-85.01873





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 3.25-3.5
Right Bank While Looking Downstream

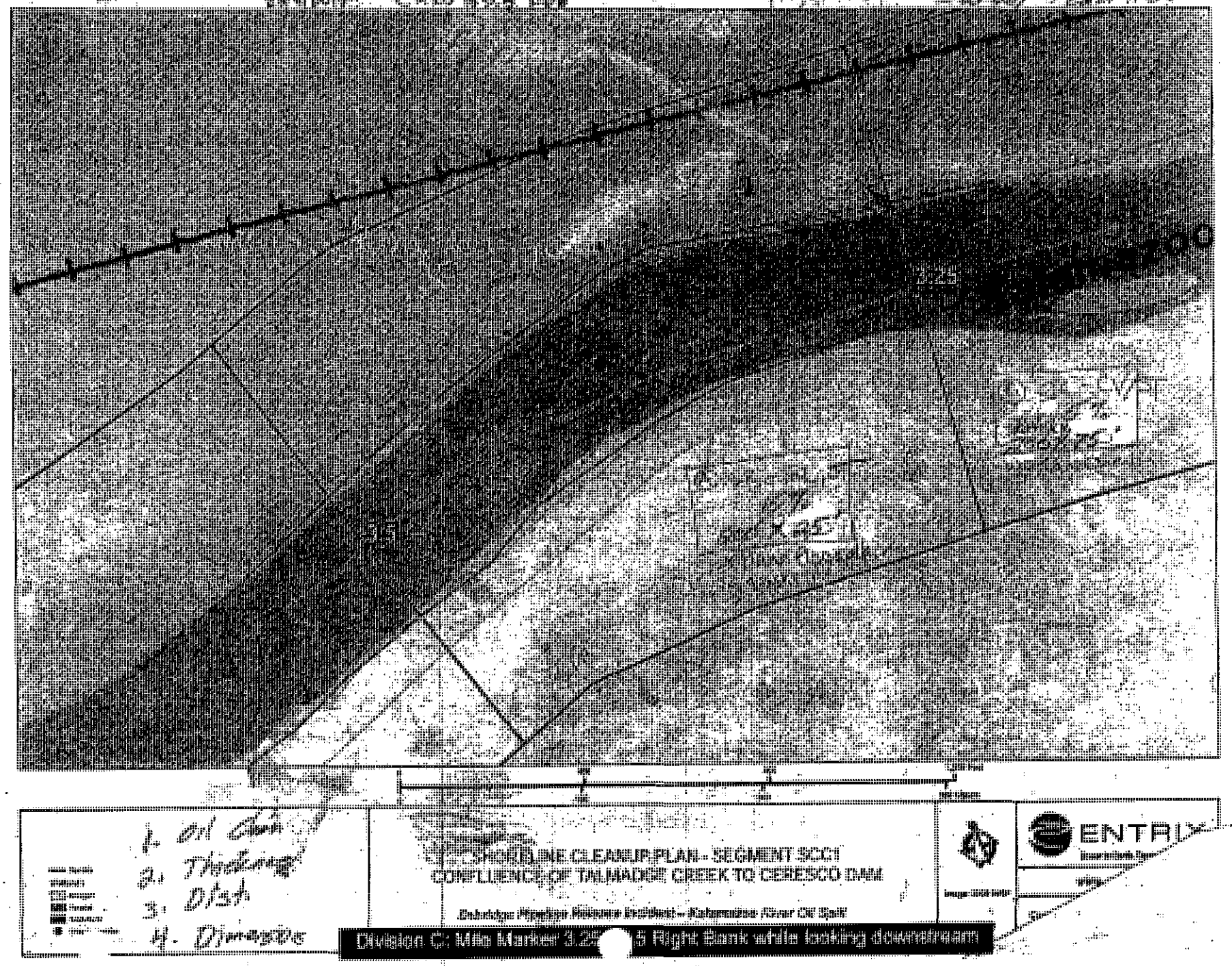
Enbridge *e Release Incident - Kalamazoo River Oil Spill*

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

System NAD 1983 State
an South Feet



Division CR Mile Marker 3.2 5 Right Bank while looking downstream

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 8-30-10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 3.25 **Start MP to End MP** 3.50 **Segment Length: 0.25 mile**

Bank: (LDB) (RDB) ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/ SUN 92 F

Field Inspection Team

Enbridge Inspector: CHRISTOPHER HAUK

Division Supervisor(Contractor):

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

MODERATE SHORELINE IMPACT
- (A) VEGITATION REMOVAL
- (B) VEGITATION REMOVAL
- (C) ROCK FLUSH and VEGITATION REMOVAL

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

VERY LIGHT IMPACT
- (A) VEGITATION REMOVED
- (B) VEGITATION REMOVED
- (C) VEGITATION REMOVED
- (D) VEGITATION REMOVED

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 8/30/10 **Time:** AM / PM

Operations Division: C **Segment ID: From** 3.25 **Start MP to End MP** 3.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

EPA Inspector: MJ Nalyn

Enbridge Inspector: Charles Strickland

Division Supervisor(Contractor): Ed Blanchard

SCAT Reviewed – Description of Clean Up Required

Flushing, Pooled oil Removed, Vegetation Removal, Debris Removal, Loose vegetation Cutting & Bagging & Limbs, Scraping heavily oiled Rocks, Dishrag pom-poms

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Recovered Material Flushed Pooled oil Removed, Vegetation cut Debris Removed, Limbs Removed, heavily oiled Rocks Cleaned

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 8/30/10 **Time:** AM / PM

Operations Division: C **Segment ID: From** 3.25 **Start MP to End MP** 3.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

EPA Inspector: [signature]

Enbridge Inspector: Charles Strickland

Division Supervisor(Contractor): Ed Blanchard

SCAT Reviewed – Description of Clean Up Required

Flushing, Pooled oil Removed, Vegetation Removed, Debris Removed, Loose vegetation Cutting & Bagging of Limbs, Scraping heavily oiled Rocks, Install pom-poms

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Reviewed Matrix Flushed Pooled oil Removed, vegetation cut Debris Removed, Limbs Removed, heavily oiled Rocks Cleaned

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Revised 8/29/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 8/30/10 **Time:** AM / PM

Operations Division: C **Segment ID: From** 3.25 **Start MP to End MP** 3.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

EPA Inspector: M J Nalyzuska

Enbridge Inspector: Charles S Strickland

Division Supervisor(Contractor): Ed Blanke

SCAT Reviewed – Description of Clean Up Required

Flushing, pooled oil Removed

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Flushing low pressure & pooled oil Removed

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 3.25-3.5 Left Bank While Looking Downstream										
SCC1-24	42.25898	-85.01953			●	●	●	●		Y / N
EPA-C-0229 (A)	42.25897	-85.01962	Shoreline	SCAT T1 8/23/10	Do not remove oiled woody plants >2", remove oil w/ vacuum or absorption, manual oil removal - shovel, rags, pads; Recommend removing loose oiled vegetation on shoreline bank.					Y N
EPA-C-0230 (1) ✓	42.25930	-85.01604	Shoreline	SCAT T1 8/23/10	Recommend removing oiled loose vegetation. Natural attenuation for rocks. Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil					Y N
EPA-C-0231 (2)	42.25927	-85.01790	Shoreline	SCAT T1 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Recommend removing oiled loose debris and scraping heavily oiled rocks.					Y N
EPA-C-0232 (3)	42.25897	-85.01962	Shoreline	SCAT T1 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Recommend maintaing asorbent pads and pom poms until sheen is gone.					Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N

* Remove Pom-Pom Boom Keep in Place, Sheen persistent

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 3.25-3.5 Right Bank While Looking Downstream										
SCC1-9	42.25953	-85.01873	Shoreline	Shoreline Assessment	●	●				Y / N
* EPA-C-0263	42.25979	85.01[illegible]	Overbank						• POINT MISSED, IN TABLE, • CHECK DATA FORMS	Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N

ok natural attn.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

SCAT REASSESSMENT REQUEST
Given to Ann Whelan 8/30/10 by KN

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 3.25 **to MP** 3.50 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAUX	8-30-10 (date)	Enbridge
M.J. Nalipinski M.J. NALIPINSKI	30 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature	8/31/10 (date)	Enbridge
Wendy D.E. Drake	8/31/10 (date)	EPA
Signature	8/31/10 (date)	MDNRE

5. **EPA**

Christine Wagner Signature	9/14/10 (date)	EPA Division Supervisor

OSC Wagner walked area on 9/14/10. Area needing minor work identified just upstream of 3.25 ROB MP. Area identified to contractor. Since this point is officially in 3.0 - 3.25 (not 3.25 - 3.5), this pkg is approved CW

Appendix E
Photos

Field Photo Log – Segment MP 3.25 to 3.50



Photo 082 – Looking west at LDB. Zone A: 20'X3' area upstream of GPS point EPA-C-0230.



Photo 083 – Looking southwest at LDB. Zone B: 30'X5" area adjacent to GPS point EPA-C-0230.

Photos depicted within this log represent the entirety of the photo documentation conducted during SCAT survey.



Photo 085 – Looking south at LDB. Zone A: 20'X3' area upstream of GPS point EPA-C-0230.



Photo 087 – Looking south at LDB. Zone C: area adjacent to GPS point EPA-C-0231.

Photos depicted within this log represent the entirety of the photo documentation conducted during SCAT survey.



Photo 088 – Looking south at LDB. Zone C: area adjacent to GPS point EPA-C-0231.



Photo 089 – Looking south at LDB. GPS points EPA-C-0230

Photos depicted within this log represent the entirety of the photo documentation conducted during SCAT survey.

Field Photo Log – Segment MP 3.25 to 3.50

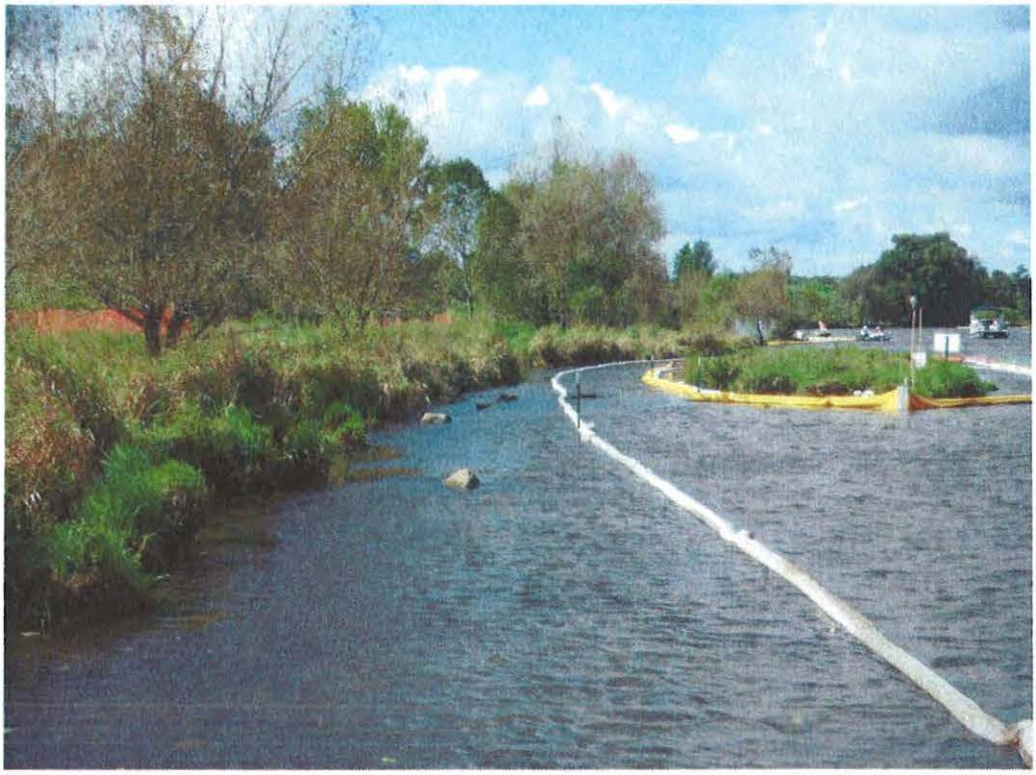


Photo 090 – Looking west by southwest at LDB. GPS points EPA-C-0229/EPA-C-0232.



Photo 091 – Looking wouth by southeast at LDB. SCC1-24

Photos depicted within this log represent the entirety of the photo documentation conducted during SCAT survey.

Field Photo Log – Segment MP 3.25 to 3.50



Photo 092 – Looking northeast at RDB. SCC1-9.



Photo 093 – Looking east at RDB. SCC1-9.

Photos depicted within this log represent the entirety of the photo documentation conducted during SCAT survey.

Field Photo Log – Segment MP 3.25 to 3.50



Photo 094 – Looking east at wetland area. Zone A: 200'X25' area near GPS point EPA-C-0263.



Photo 095 – Looking west at wetland area. Zone A: 200'X25' area near GPS point EPA-C-0263.

Photos depicted within this log represent the entirety of the photo documentation conducted during SCAT survey.

Field Photo Log – Segment MP 3.25 to 3.50



Photo 096 – Looking northeast at RDB. Zone B: 200'X 75' area near GPS point EPA-C-0263.

Photos depicted within this log represent the entirety of the photo documentation conducted during SCAT survey.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 3.75 – MP 3.50 to 3.75

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 3.75 had moderate oiling on the left descending bank with oiled vegetation, oiled debris and oiled soil. Three islands were present with pooled oil present on the interior and tar present along the shore. Very light oiling, oiled vegetation, oiled debris and oiled soil were observed on the right descending bank. The overbanks contained no areas requiring clean-up.

Actions

The shoreline clean-up activities within Segment 3.75 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs;
- Removal of oiled debris;
- High pressure flushing of man-made structures and/or rocks;
- Removal of pooled oil;
- Mechanical removal of aquatic vegetation

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along left descending bank near EPA-C-0233, the second island and MP 3.75, along the right descending bank near EPA-C-0239 and on all three islands;
- Oiled woody vegetation on left descending bank near EPA-C-0233, along the right descending bank across from EPA-C-0233 and on the second and third islands from MP 3.50;

- Oiled herbaceous vegetation on first island near MP 3.50;
- Oiled rocks and cobble along the left descending bank near EPA-C-0233.

Segment 3.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Docnmentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**

Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

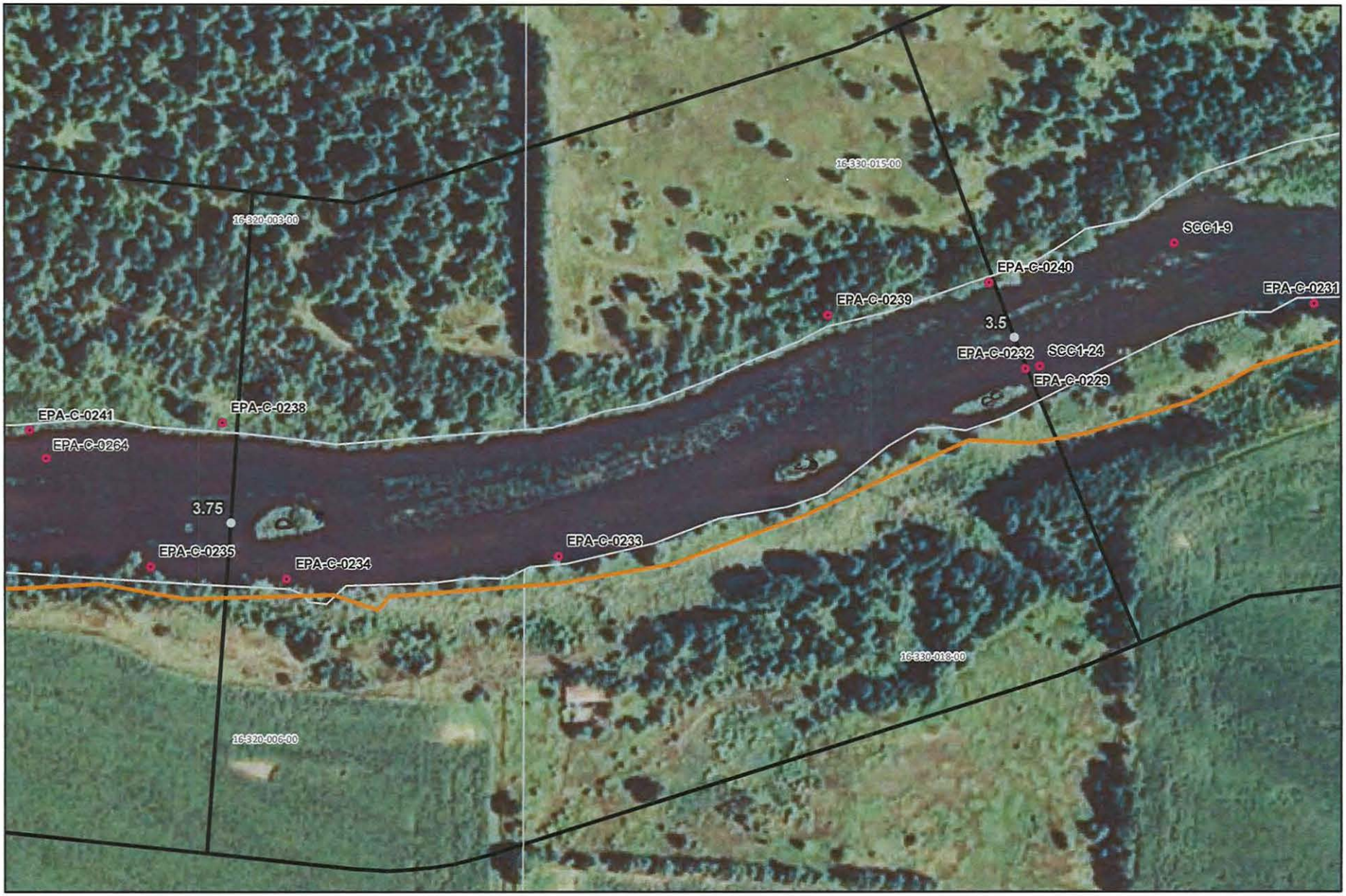
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 3.5-3.75 Left Bank While Looking Downstream									
EPA-C-0233	Shoreline	40413	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.				Remove loose oiled debris manually if possible. Otherwise recommend natural attenuation.	42.25812	-85.02240
EPA-C-0234	Shoreline	40413	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.				Maintain booms in this area. Pom poms are soiled and need changing. No recommendations for shoreline.	42.25801	-85.02402





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 3.5-3.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

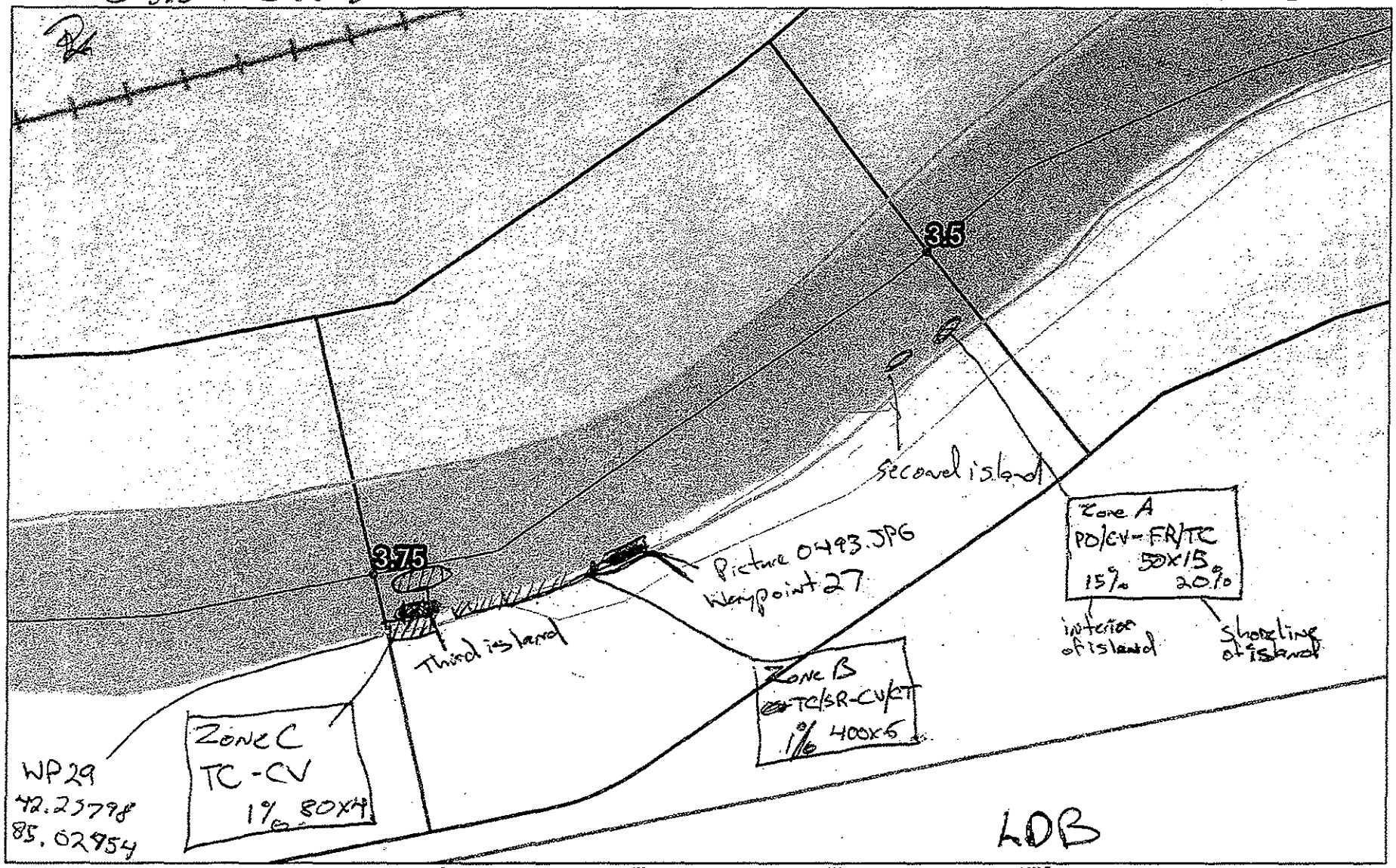
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

C3.5 to C3.75

4 of 6



Shoreline
Wetlands
Emergent
Forested
Scrub-Shrub
River_QuarterMiles

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET 1: 48

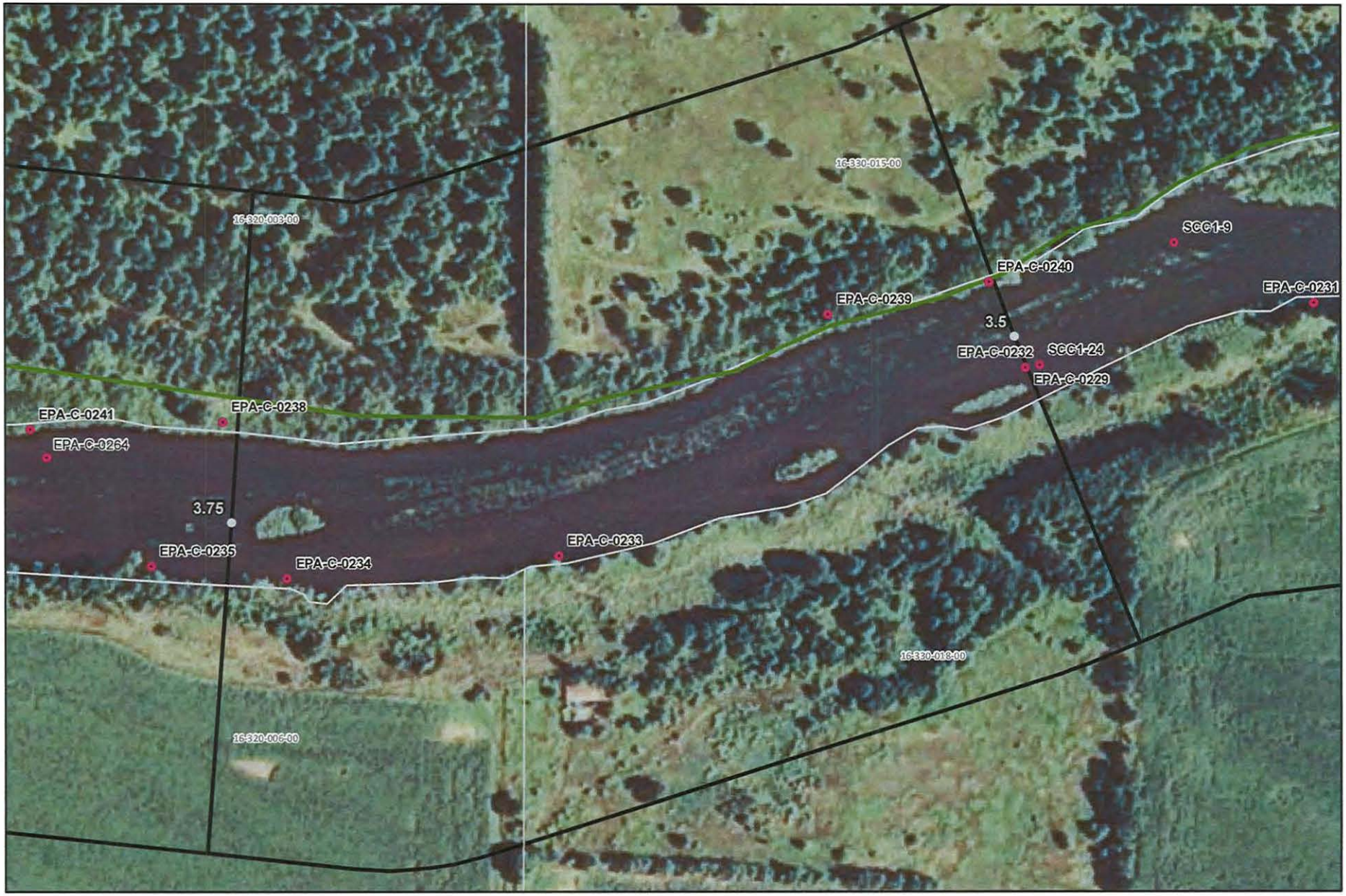
ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Division C: Mile Marker 3.5 - 3.75 Left Bank while looking downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 3.5-3.75 Right Bank While Looking Downstream									
EPA-C-0238	Shoreline	SCAT T2 8/23/10	Rake and remove right by MP3.5...the oiled vegetation only. Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.					42.25870	-85.02441
EPA-C-0239	Shoreline	SCAT T2 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Recommend natural attenuation.					42.25920	-85.02080
EPA-C-0240	Shoreline	SCAT T2 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.					42.25935	-85.01984





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 3.5-3.75
Right Bank While Looking Downstream

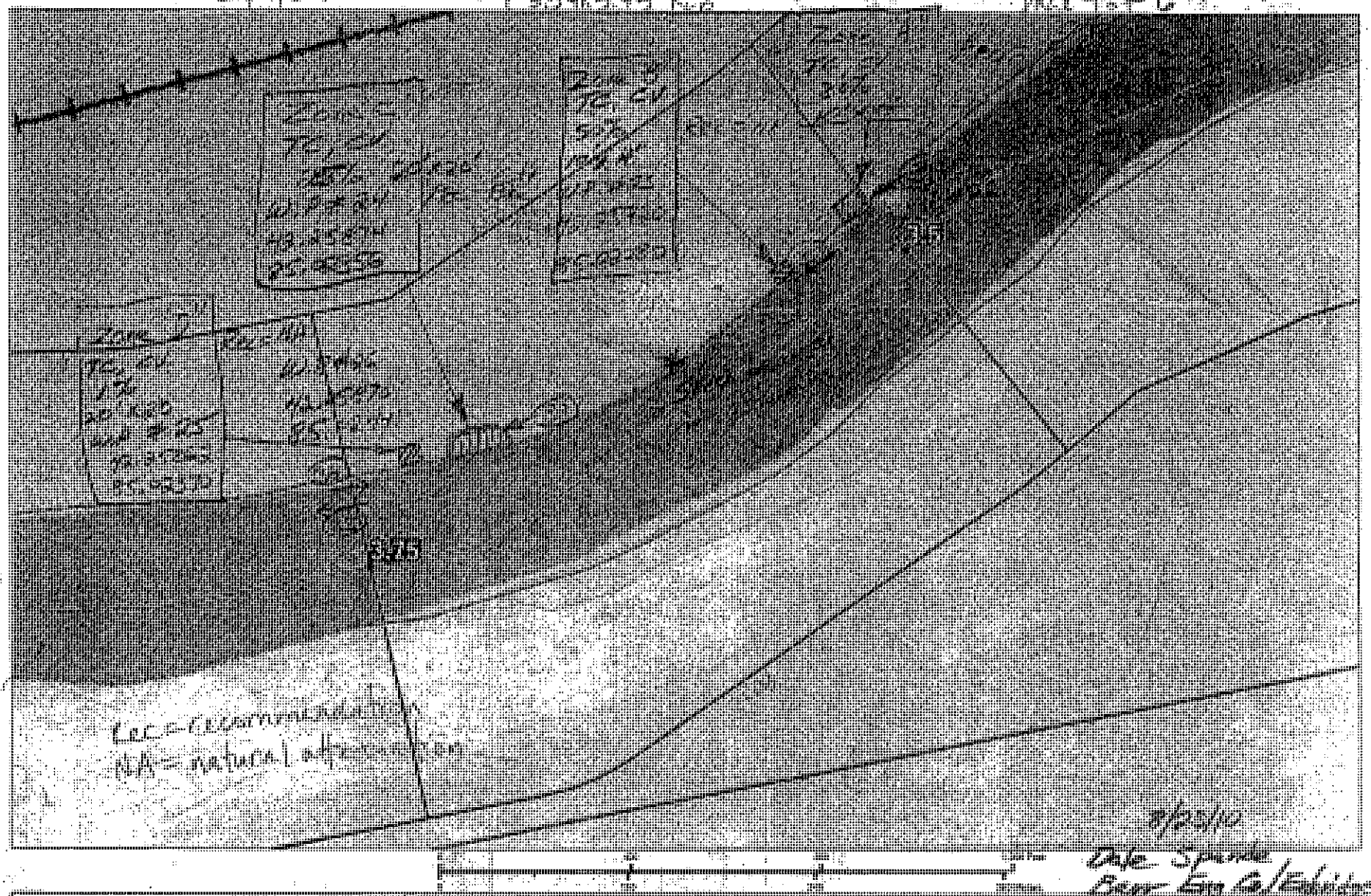
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

Division C: Mile Marker 3.6 - 3.75 Right Bank while looking downstream

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
CRAFT INSPECTION REPORT (CIR)

Date: 9/11/10 Time: (AM) / PM

Operations Division: C Segment ID: From 3.5 Start MP to End MP 3.75 Segment Length: 0.25 mile

Bank: (LDB) / (RDB) ☒ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ Rain

Field Inspection Team

Enbridge Inspector: Ben Frings

Division Supervisor(Contractor): Joshua Schrag

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/11 **Time:** AM / PM

Operations Division: 1 **Segment ID: From** 3.5 **Start MP to End MP** 3.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

Enbridge Inspector: Charles Strickland

Division Supervisor(Contractor): Dale Hennaway

SCAT Reviewed – Description of Clean Up Required

Recommendations are to Cut & Bag Limbs Remove debris & woody plants and Natural Attenuation Remain

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

overhanging limbs & debris was Cut & Bagged woody plants Remain in place along with Areas Recomended for natural Attenuation

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 3.5-3.75 Left Bank While Looking Downstream										
Zone B EPA-C-0233	Shoreline	40413	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled Remove loose oiled debris manually if possible. Otherwise recommend natural attenuation. woody plants >2", no scraping, leave oiled soil.					42.25812	-85.02240	Y / N
EPA-C-0234	Shoreline	40413	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Maintain booms in this area. Pom poms are soiled and need changing. No recommendations for shoreline.					42.25801	-85.02402	Y / N

Printed Team Members Name:
Date:
Comments:

Assured third island is part of zone C - no additional rec. SCAT Satisfactory
Shoreline of zone C still has a small part 2X2 - ~~no~~ we removed it

Based on hand drawn map, assures Islands are zone A - sheen coming off (badly) & loose oil, - called Hot Shot team to place Sorbent pads ~~(Island~~ C - LDB)

Islands B - also part of zone A has lots of sheen. Contained structure is in place
SCAT satisfactory

Team 3 9/15/10
Amanda Bohnbust
Katie Forchild
Ross Del Rosso

Zone A refers to EPA-C-0240
Zone B refers to EPA-C-0239 } other side of river
Zone C refers to EPA-C-0234

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 3.5-3.75 Right Bank While Looking Downstream										
EPA-C-0238	Shoreline	SCAT T2 8/23/10	Rake and remove right by MP3.5...the oiled vegetation only. Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.					42.25870	-85.02441	(Y) / N
EPA-C-0239	Shoreline	SCAT T2 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Recommend natural attenuation.					42.25920	-85.02080	(Y) / N
EPA-C-0240	Shoreline	SCAT T2 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.					42.25935	-85.01984	(Y) / N

Printed Team Members Name:
Date:
Comments:

saw another flagged zone B, at GPS 42.25920 -85.02074 - SCAT satisfactory

zone C flag not labeled. Woody veg > 2" has been removed

→ not flagged in full - used GPS to find location. note says zone is by MP 3.5 but it's actually by 3.75

Team 3 9/15/10
Amanda Bohrenblust
Katie Fachini
Ross Del Rosso

Zone A refers to EPA-C-0240 ✓
Zone B refers to EPA-C-0239 ✓
Zone C- tar covered vegetation (20' X 20') recommend raking of tar covered vegetation 42.25874 -85.02356 (Y) N
Zone D refers to EPA-C-0238 ✓

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 3.5 to MP 3.75 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

DAVE HOOEK 9/14/2010 Signature (date) Enbridge

Eduardo Rovira 9/14/10 Signature (date) EPA

Eduardo Rovira

4. **SCAT Reassessment**

9/15/10 Signature (date) Enbridge

Amanda Bohnenblust

R. del Rosario 9/15/10 Signature (date) EPA

ROSS DEL ROSARIO

Kathleen R. Fairchild 9/15/10 Signature (date) MDNRE

Kathleen R. Fairchild

5. **EPA**

Christine Wagner 9/19/10 Signature (date) EPA Division Supervisor

Island D - Boom is damaged. Needs repair.

Appendix E
Photographs



Photo 0426 – Looking southwest at right descending bank, near EPA-C-0240.



Photo 0427 – Looking southwest at right descending bank, near EPA-C-0239.



Photo 0428 – Looking southwest at right descending bank.



Photo 0429 – Looking northeast at right descending bank, near EPA-C-0239.



Photo 0430 – Looking northwest at right descending bank.



Photo 0431 – Looking southwest at right descending bank, near EPA-C-0238.



Photo 0432 – Looking south at left descending bank, near EPA-C-0234.



Photo 0433 – Looking east at left descending bank.



Photo 0434 – Looking south at left descending bank.



Photo 0435 – Looking southwest at left descending bank.



Photo 0436 – Looking southeast at left descending bank.



Photo 0437 – Looking southeast at left descending bank.



Photo 0438 – Looking southeast at right descending bank, near EPA-C-0233.



Photo 0439 – Looking southeast at left descending bank.

Field Photo Log – Segment 3.75



Photo 0440– Looking southeast at island.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Response Completion Report
Kalamazoo River Segment 4.00 – MP 3.75 to 4.00

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the response completion report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 4.00 had moderate oiling including oiled soil, oiled vegetation, oiled woody debris and oiled logs on the left descending bank; and very light oiling, including oiled vegetation on the right descending bank. The overbank areas contained no oil, one island was present with no oiling observed. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 4.00 consisted of the following.

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- Removal of overhanging limbs
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris
- Scraping of oil from large diameter stumps and logs
- Mechanical aquatic vegetation removal

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled vegetation on the left descending bank between EPA-C-0235 and EPA-C-0236
- Oiled logs on the left descending bank near MP 4.00 and on the right descending bank near MP 3.75

- Oiled debris near EPA-C-0237
- Oiled soil along left and right descending banks

Segment 4.00 has reached the operational endpoints pursuant to EPA's Clean Water Act. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Stcp 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been complcted
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

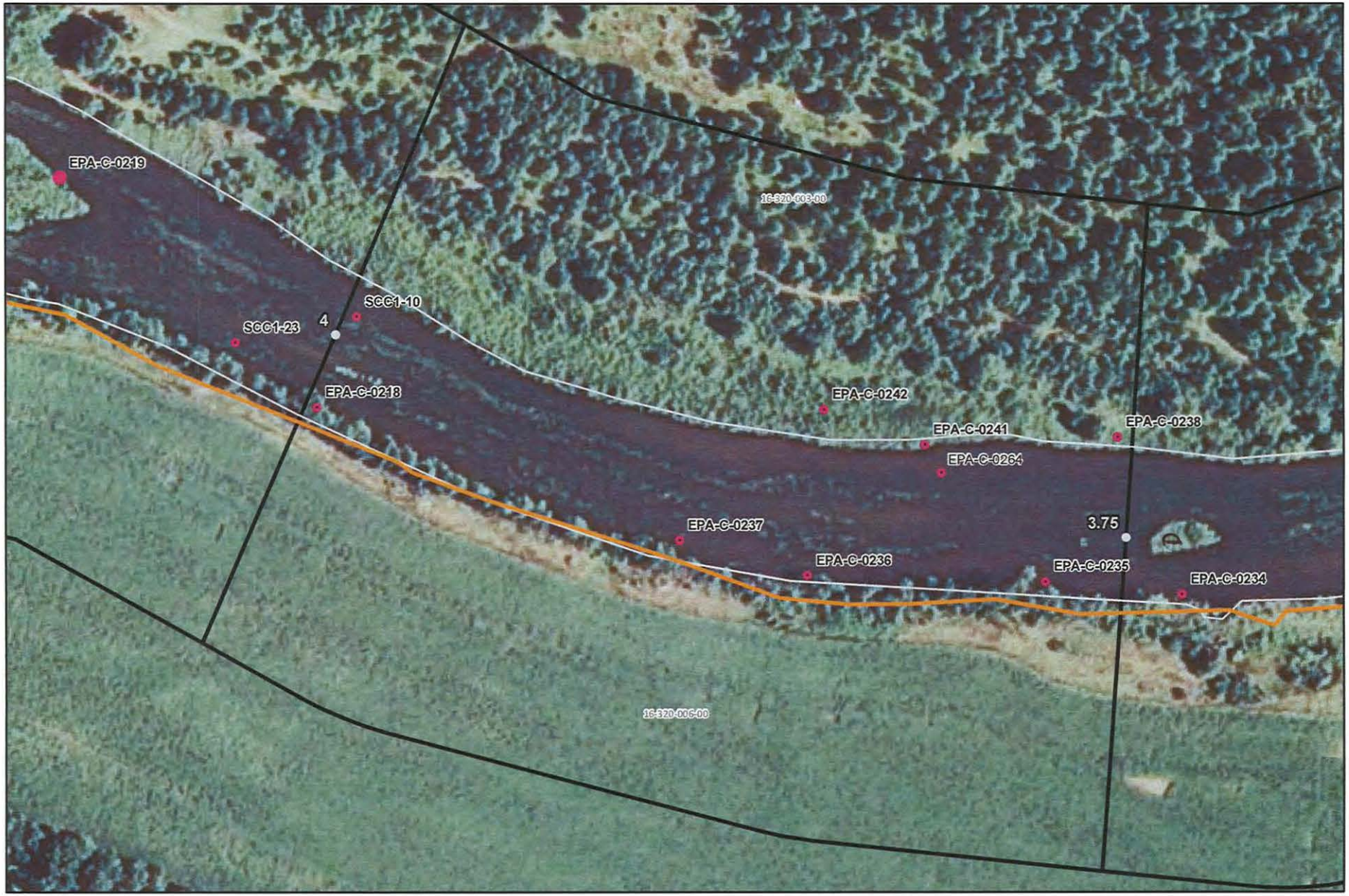
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 3.75-4 Left Bank While Looking Downstream									
EPA-C-0235	Shoreline	SCAT T1 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Maintain absorent boom and remove loose oiled veg if possible.					42.25806	-85.02483
EPA-C-0236	Shoreline	SCAT T1 8/23/10	t and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Maintain absorbent pads and pom poms. Remove loose woody debris that is oiled.near start of zone and close to large dia.l overhanging log.					42.25808	-85.02624
EPA-C-0237	Shoreline	SCAT T1 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Remove loose oiled veg but not intact roots. Remove oiled 2x2 foot plank. Maintain pom poms and absorbent pads at this location. Manually remove scrap tar coating off large dia. logs and stump without removing logs.					42.25823	-85.02700





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 3.75-4
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

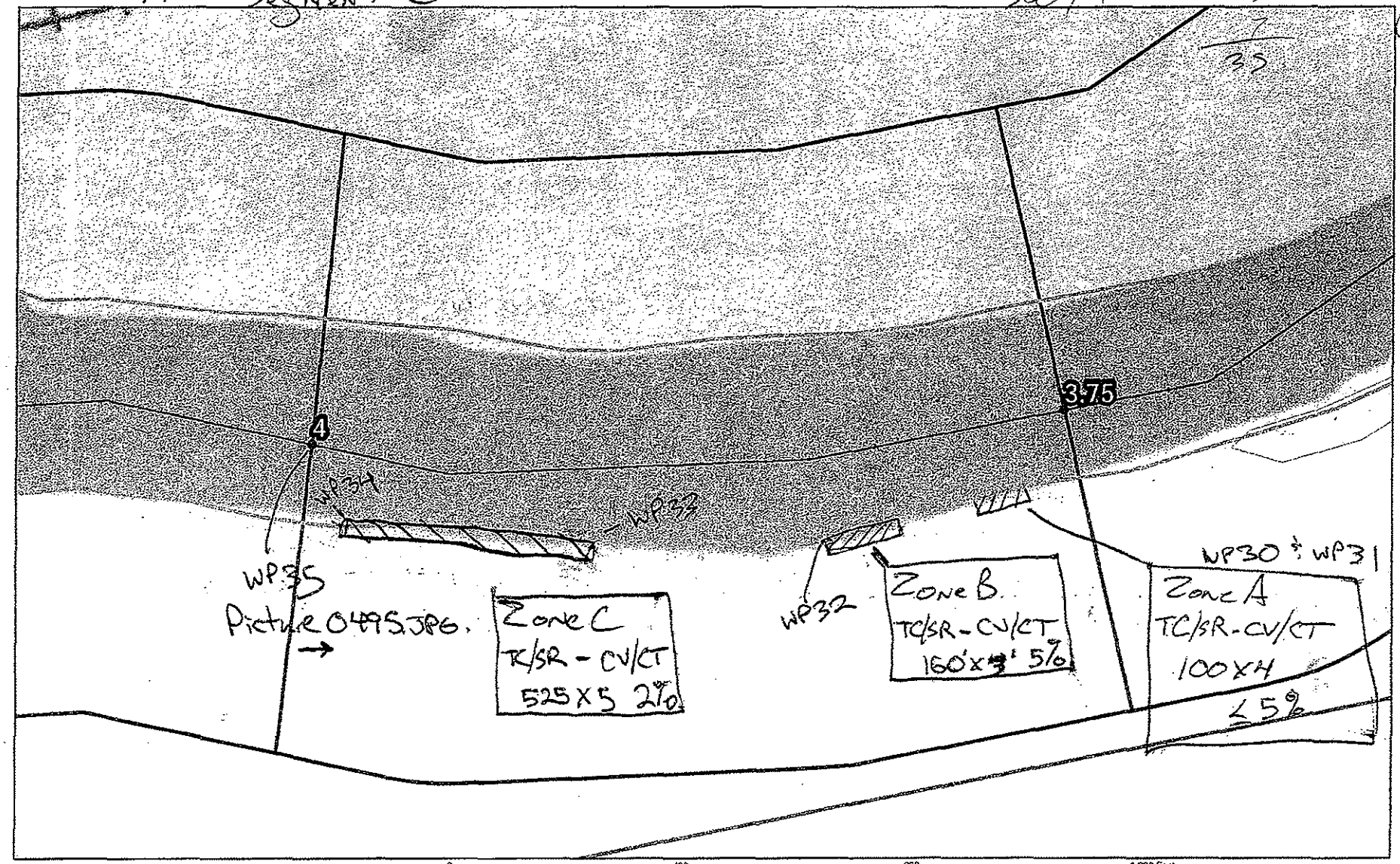
Coordinate System: NAD 1983 State Plane Michigan South Feet

LDB Segment C

300/4 .75 G FG

9

7/35



0 400 800 1,200 Feet

0 120 240 360 Meters

100 200

Shoreline
Wetlands
Emergent
Forested
Scrub-Shrub
River_Quarter-Mile

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 48

ENTRIX
Down to Earth. Down to Business.

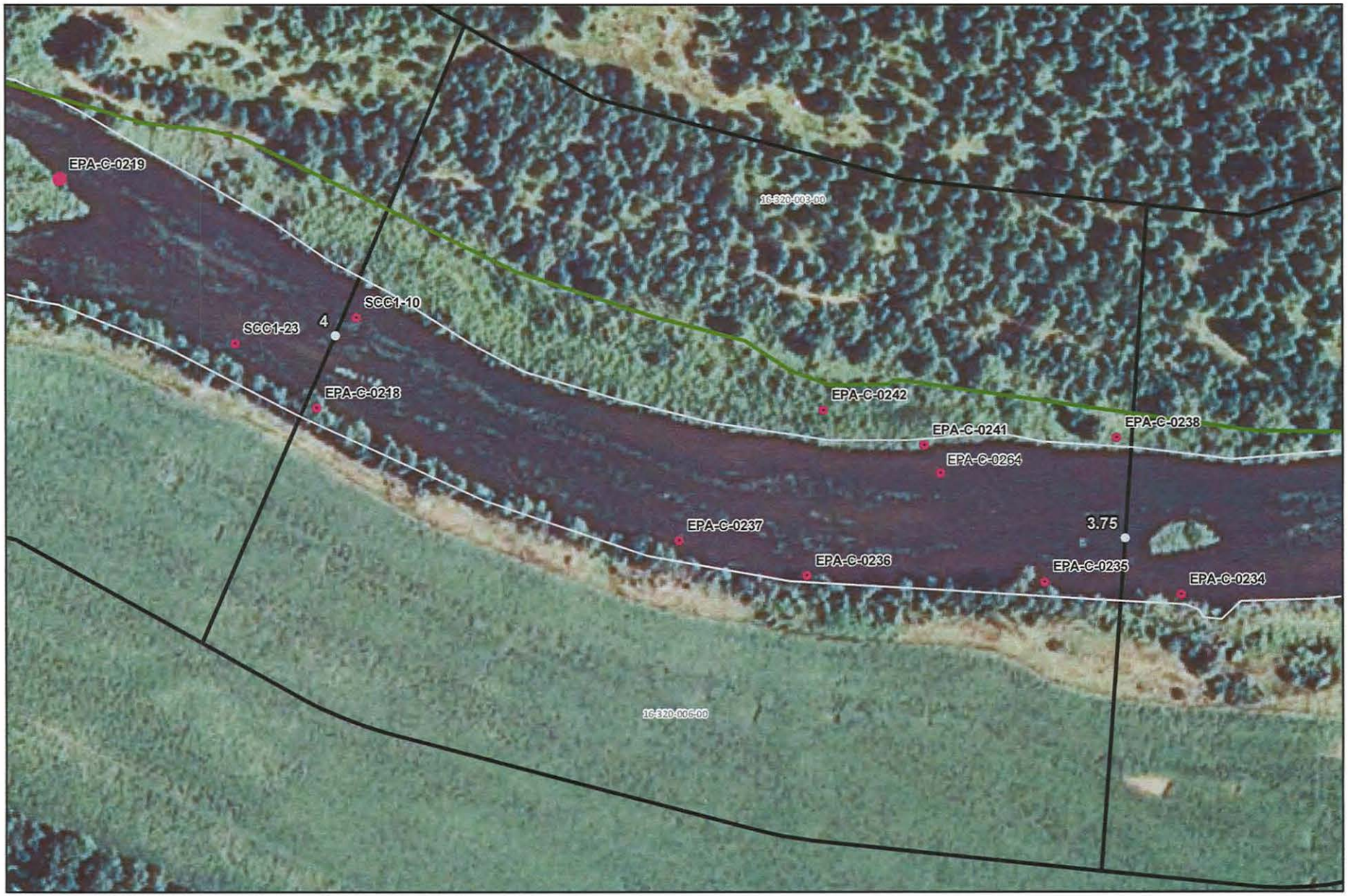
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Division C: Mile Marker 3.75 - 4 Left Bank while looking downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 3.75-4 Right Bank While Looking Downstream									
SCC1-10	Shoreline	Shoreline Assessment	•	•	•	•		42.25920	-85.02892
EPA-C-0241	Shoreline	SCAT T2 8/23/10	Recommend natural attenuation. Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.					42.25866	-85.02555
EPA-C-0242	Shoreline	SCAT T2 8/23/10	limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Recommend natural attenuation in this area HOWEVER remove pom poms at WP028 (45.25882/85.02734).					42.25881	-85.02615





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 3.75-4
Right Bank While Looking Downstream

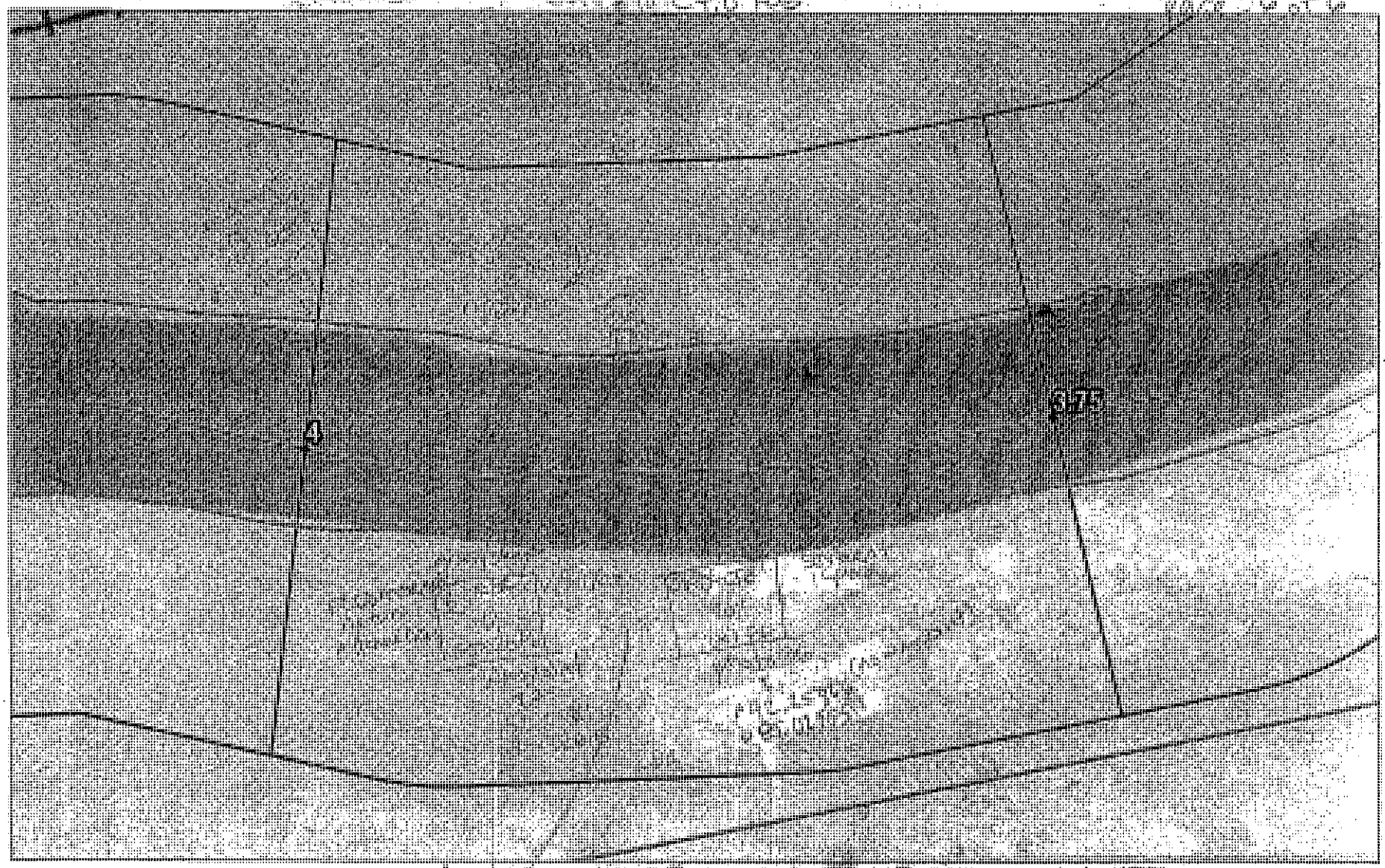
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



SHORELINE CLEANUP PLAN - SEGMENT SC01
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

Division C: Mile Marker 3.75 - 4 Right Bank while looking downstream

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
CRAFT INSPECTION REPORT (CIR)

Date: 8/30/10 Time: AM / PM

Operations Division: C Segment ID: From 3.75 Start MP to End MP 4.0 Segment Length: 0.25 mile

Bank: LDB RDB ☒ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector: Ben Frings

Division Supervisor(Contractor): Wade Gannaway

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 8/30/10 **Time:** AM / PM

Operations Division: C **Segment ID: From** 3.75 **Start MP to End MP** 4.0 **Segment Length:** 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

EPA Inspector: MJ Nahrgang

Enbridge Inspector: Charles Strickland

Division Supervisor(Contractor): Ese Ruley

SCAT Reviewed – Description of Clean Up Required

Cut & Bag Limbs, Remove oiled vegetation Remove loose woody debris Scrape tar coatings on large dia. Logs & Stumps

Clean Up Performed – Description of Clean Up Complete

☒ **SCAT Requirements/Clean Up Complete**

Limbs Removed, oiled vegetation Removed, woody debris Removed oil scraped from large Dia Stumps & Logs

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 8/30/2010 **Time: AM / PM**

Operations Division: C **Segment ID: From** 3.75 **Start MP to End MP** 4.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

EPA Inspector: [signature]

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

Flushing, pooled oil Removal vegetation & Debris removal
Cutting of Limbs

Clean Up Performed – Description of Clean Up Complete

☒ **SCAT Requirements/Clean Up Complete**

Bank flushed, pooled oil Removed, oiled vegetation Removed
overhanging limbs Cut & Bagged

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 3.75-4 Left Bank While Looking Downstream										
EPA-C-0235 ✓	42.25806	-85.02483	Shoreline	SCAT T1 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Maintain absorent boom and remove loose oiled veg if possible.					(Y) / N
EPA-C-0236 ✓	42.25808	-85.02624	Shoreline	SCAT T1 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Maintain absorbent pads and pom poms. Remove loose woody debris that is oiled.near start of zone and close to large dia.l overhanging log.					(Y) N
EPA-C-0237 ✓	42.25823	-85.02700	Shoreline	SCAT T1 8/23/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Remove loose oiled veg but not intact roots. Remove oiled 2x2 foot plank. Maintain pom poms and absorbent pads at this location. Manually remove scrap tar coating off large dia. logs and stump without removing logs.					(Y) / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N

- OILED DEBRIS REMAINING

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 3.75-4 Right Bank While Looking Downstream										
SCC1-10 ISLAND	42.25920	-85.02892	Shoreline	Shoreline Assessment	•	•	•	•		Y / N
EPA-C-0241 (2)	42.25866	-85.02555	Shoreline	SCAT T2 8/23/10	Recommend natural attenuation. Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.					Y / N
(1) EPA-C-0242 ✓	42.25881	-85.02615	Shoreline	SCAT T2 8/23/10	limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil. Recommend natural attenuation in this area HOWEVER remove pom poms at WP028 (45.25882/85.02734).					Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N

Re-do Scat

Yes on 9/7

* Yes on 9/7

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

SCAT Reassessment Request
Given to Ann Whelan 8/30/10 by KN

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 3.75 **to MP** 4.00 **Segment Length: 0.25 mile**

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature CHRISTOPHER HAWK	8-30-10 (date)	Enbridge
M.J. Nalipinski M.J NALIPINSKI	30 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Loan	9/7/2010 (date)	Enbridge
Gary A. Andrew	9.7.10 (date)	EPA
Signature	9/31/10 (date)	MDNRE 9/7/10 Christopher Clampitt

5. **EPA**

Christine Wagner	9/19/10 (date)	EPA Division Supervisor

Inspected 9/19. Hard boom dislodged around Island D., but all ok for SCAT CW

Appendix E
Photographs



Photo 0271 – Looking north at right descending bank. Near EPA-C-0238.



Photo 0272 – Looking northwest at right descending bank. Near EPA-C-0241.



Photo 0273 – Looking east at right descending bank (overbank). Near EPA-C-0242.



Photo 0274 – Looking southwest at left descending bank. Near Zone A.

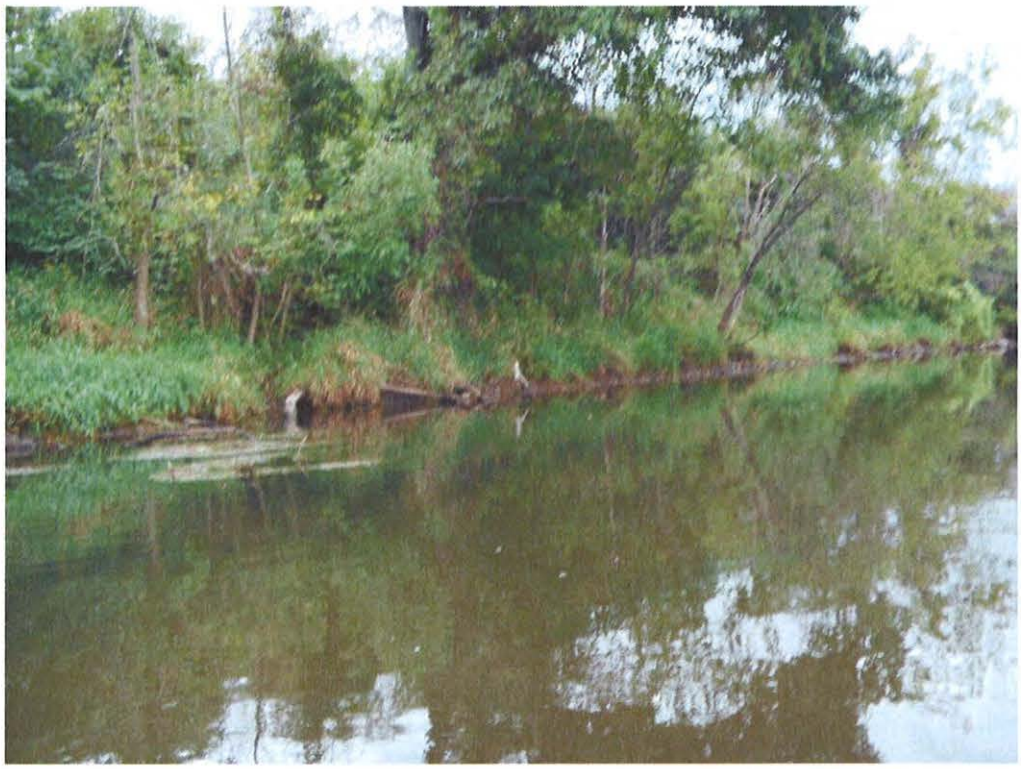


Photo 0275 – Looking southwest at left descending bank. Near Zone B.



Photo 0276 – Looking southwest at left descending bank. Near Zone C.



Photo 0277 – Looking southwest at left descending bank. Near Zone C.



Photo 0278 – Looking southwest at island. Near SCC1-10.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 4.25 – MP 4.0 to 4.25

Enbridge Energy

September 22, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 4.25 had moderate level of oil staining on the left descending bank and no operational focus areas observed on left descending overbank. Oil saturated vegetation, debris, and soil was observed on shoreline and overbank of the island, as well as pooled oil. The right descending bank had very light oil staining, pooled oil, and coated vegetation. No operational focus areas observed on the right descending overbank.

Actions

The shoreline clean-up activities within Segment 4.25 consisted of the following:

- Pooled oil removal with low pressure/high volume flush and absorption methods;
- Removal of oiled vegetation leaving roots intact;
- Rake and remove oiled debris;
- Cut and bag low hanging limbs extending over and into the water 2" above oiling level;
- Mechanical aquatic vegetation removal;
- Pooled oil removal;
- Manual soil scraping and the LDB at the upstream end of the emergent wetland, as discussed with the division supervisor;

Post Re-Assessment Actions

- Mechanical soil removal was completed on the island as requested to remove impacted loose soil to protect public health and the environment.

Outcome

The island located within this segment has been recommended to the priority list for operations and maintenance, which include a long term remediation plan due to heavily saturated oiled soil. Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody vegetation along the left descending bank.
- Oiled soil and herbaceous vegetation on island.

Segment 4.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
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Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
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ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
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AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

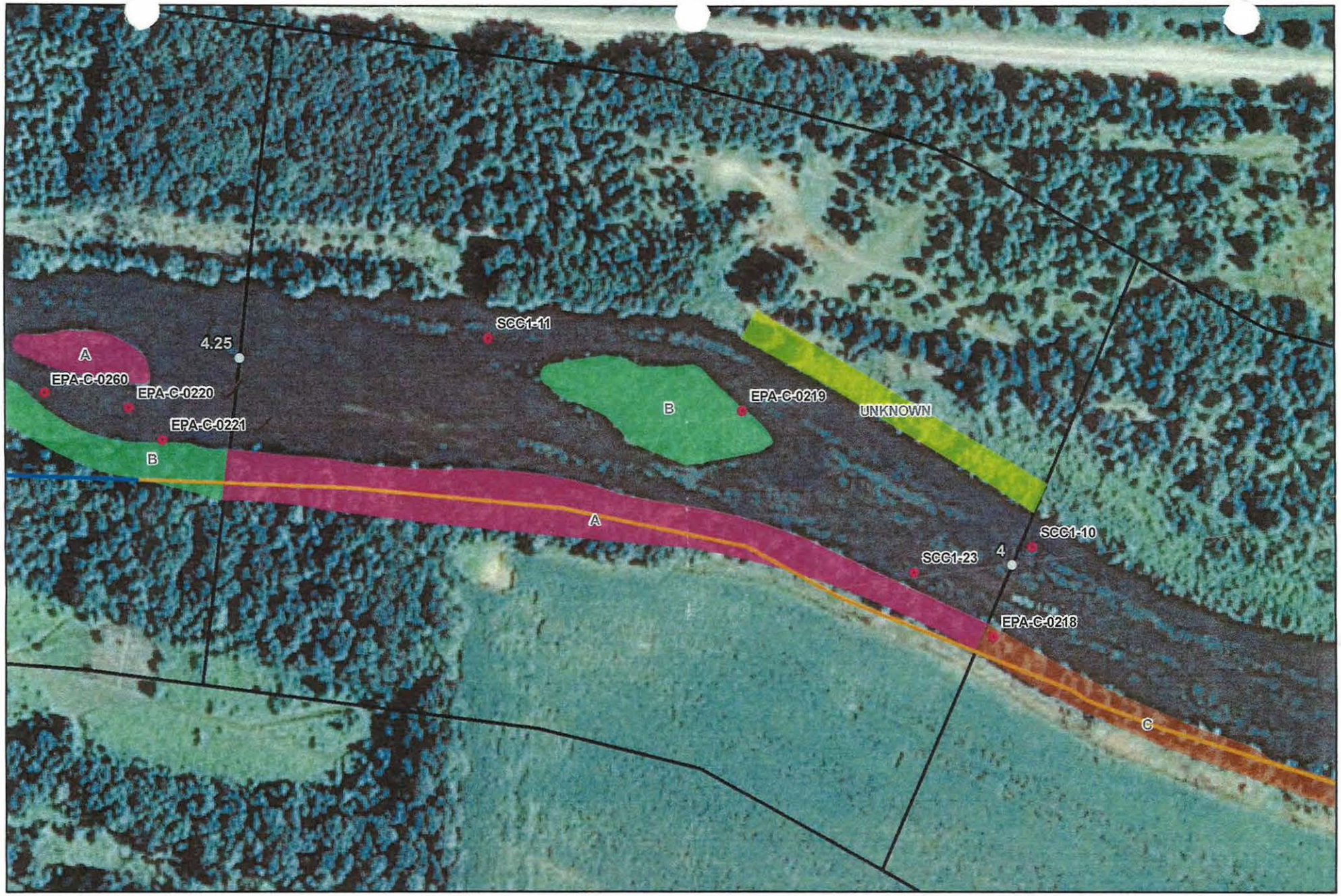
- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 4-4.25 Left Bank While Looking Downstream									
SCC1-23	Shoreline	Shoreline Assessment	•		•	•		42.25908	-85.02963
EPA-C-0218	Shoreline	SCAT T1 8/25/10	Recommend rake and remove oiled debris.					42.25880	-85.02915





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

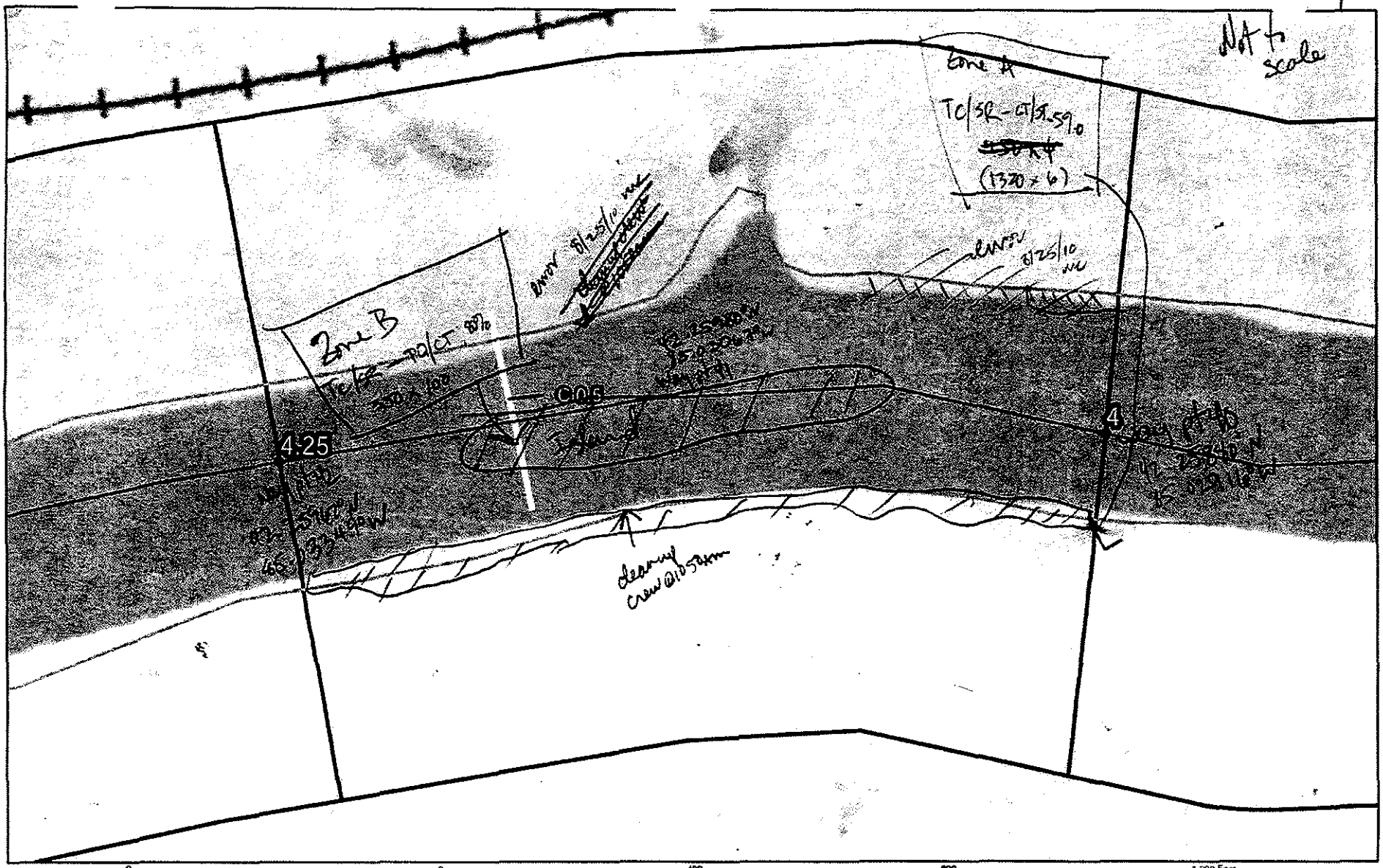
Division C: Mile Marker 4-4.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

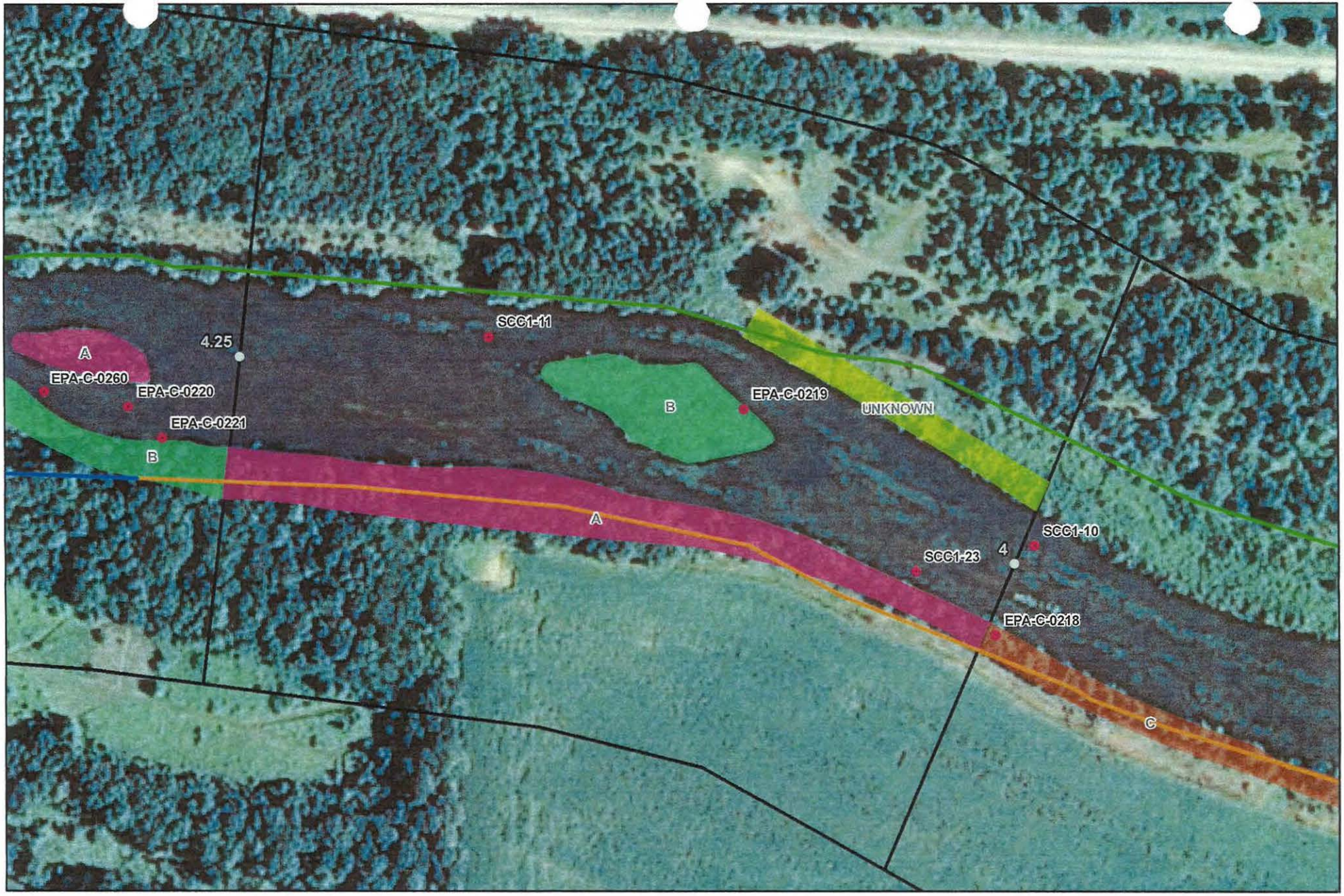
ENTRIX
www.entrix.com
Coordinate System NAD 1983 State Plane Michigan South Feet



Division C: Mile Marker 4.25 Left Bank while looking downstream

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 4-4.25 Island									
EPA-C-0219	Shoreline/ Overbank	SCAT T1 8/25/10	Absorb pooled oil with pads and pom poms on the island at WP41. Minimize entry. Consider longterm cleanup priorities of oil deposition underneath wetland vegetation.					42.25980	-85.03067



Division C: Mile Marker 4-4.25 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

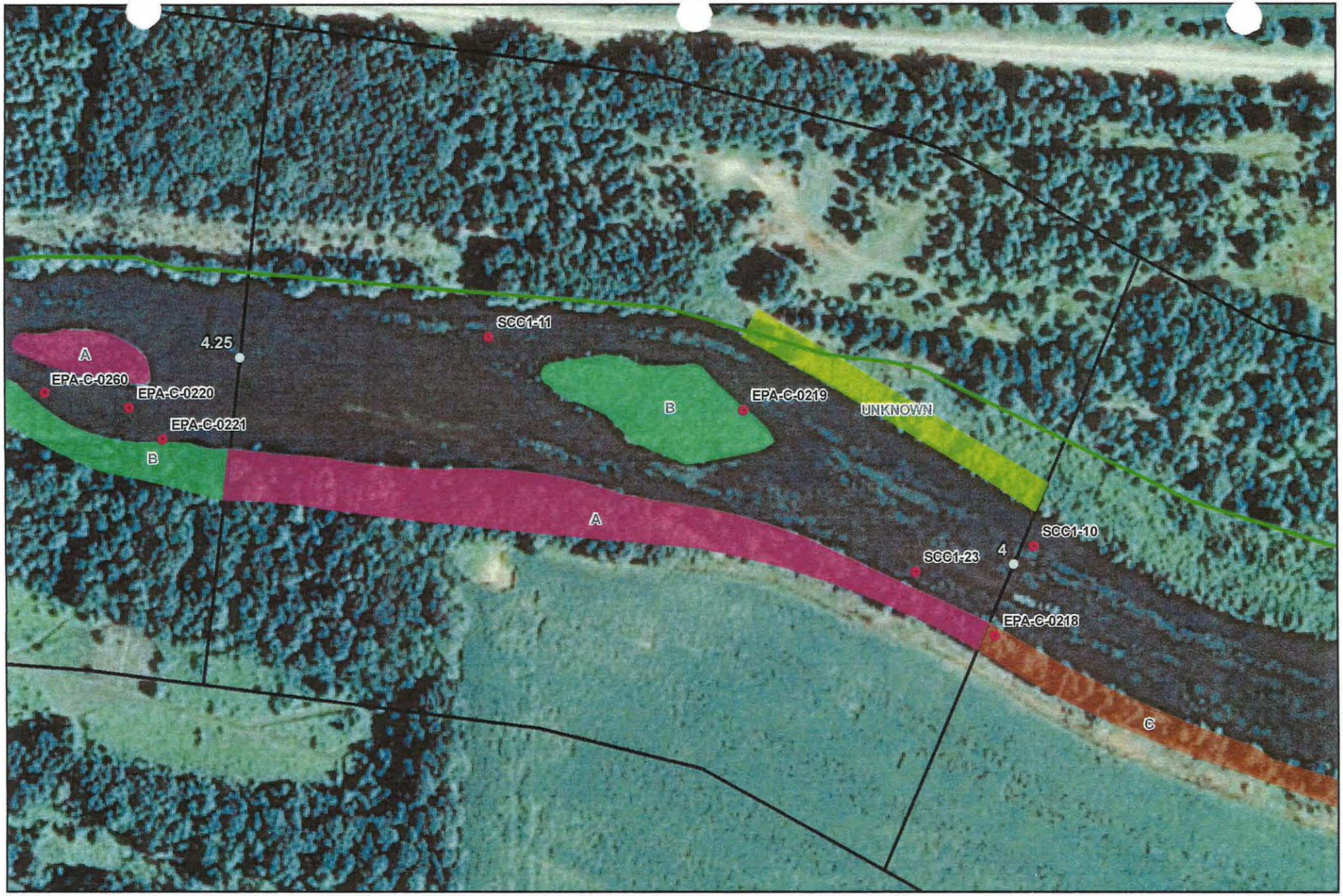
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 4-4.25 Right Bank While Looking Downstream									
SCC1-11	Shoreline	Shoreline Assessment	•	•	•	•		42.26012	-85.03220





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 4-4.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/12/10 Time: AM / PM

Operations Division: C Segment ID: From 4.0 Start MP to End MP 4.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☒ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: ELMER GUY TOWNER

Division Supervisor(Contractor): DOUG BLAKEMORE

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/2/10 **Time: AM / (PM)**

Operations Division: 2 **Segment ID: From** 4.0 **Start MP to End MP** 4.25 **Segment Length: 0.25 mile**

Bank: (LDB) / (RDB) ☐ Island

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

Enbridge Inspector: Wade Strickland

Division Supervisor(Contractor): Wade Ramsey

SCAT Reviewed – Description of Clean Up Required

Recommendations are to Absorb pooled oil, Shoreline flushing, vegetation removal and the removal of Debris

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Pooled oil has been removed Shoreline has been flushed along with vegetation cut & Debris removal Island flushing

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 4-4.25 Left Bank While Looking Downstream										
SCC1-23	Shoreline	Shoreline Assessment	•		•	•		42.25908	-85.02963	(Y) / N
EPA-C-0218	Shoreline	SCAT T1 8/25/10	Recommend rake and remove oiled debris.					42.25880	-85.02915	(Y) / N

Printed Team Members Name: MIKE ZAMBETIS (ENBRIDGE)
HOWARD PLEAM (US EPA)
MATT WESENER (MDNRE)
Date: 9/20/10
Comments:

Zone A refers to SCC1-23

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 4-4.25 Island										
EPA-C-0219	Shoreline/ Overbank	SCAT T1 8/25/10	Absorb pooled oil with pads and pom poms on the island at WP41. Minimize entry. Consider longterm cleanup priorities of oil deposition underneath wetland vegetation.					42.25980	-85.03067	Y / N

Printed Team Members Name: MIKE ZAMBETIS (ENBRIDGE),
Date: 9/20/10
Comments:
- ISLAND HEAVILY SATURATED WITH OIL & IMPACTED BY CLEAN UP ACTIVITIES - NEEDS LONG TERM REMEDIATION PLAN - MOVE TO SCAT RE-ASSESSMENT OPERATION & MAINTENANCE PRIORITY LIST.

Zone B refers to EPA-C-0219

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 4-4.25 Right Bank While Looking Downstream										
SCC1-11	Shoreline	Shoreline Assessment	•	•	•	•		42.26012	-85.03220	(Y) / N

Printed Team Members Name: MIKE ZANDSTRA (ENBRIDGE)
Date: 9/20/10
Comments: HOWARD PHAM (USEPA).
MATT WESENER (MDNRE)

Unknown zone on right bank comments are unreadable, please check area outlined in map to verify no cleanup recomendations ✓

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 4.0 to MP 4.25 Segment Length: 0.25 mile

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature DAVE HOOEY 9/15/2010 (date) Enbridge

Signature Eduardo Rivera 9/15/10 (date) EPA

Eduardo Rivera

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBETIS 9/20/10 (date) Enbridge

Signature MATTHEW D WESENER 9/20/10 (date) ~~EPA~~ MDNRE MDW

Signature HOWARD PHAM. 9/20/10 (date) ~~MDNRE~~ EPA

5. **EPA**

Signature 9/22/10 (date) EPA Division Supervisor

Appendix E
Photographs

Field Photo Log – Segment 4.25



Photo 0932 – Facing south at left descending bank near SCC1-23



Photo 0934 – Facing southwest at left descending bank.

Field Photo Log – Segment 4.25



Photo 0937 – Facing northeast at island near zone B.



Photo 0939 – Facing northwest at island near zone B.

Field Photo Log – Segment 4.25



Photo 0943 – Facing northeast at right descending bank.



Photo 0944 – Facing south at island near zone B.

Field Photo Log – Segment 4.25

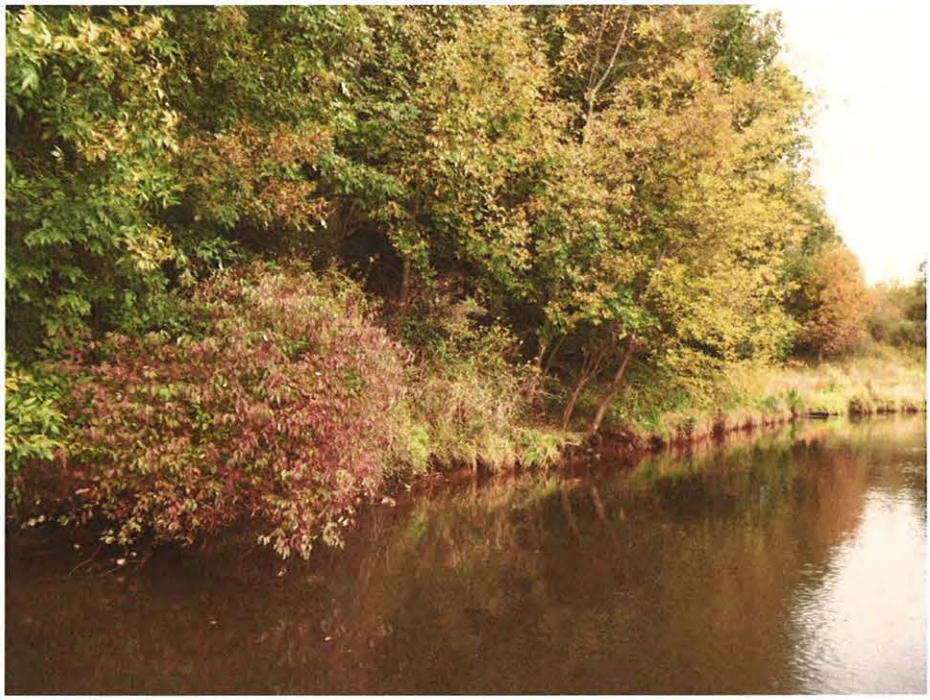


Photo 0945 – Facing northeast at right descending bank.



Photo 0947 – Facing east at island near EPA-C-0219.

Field Photo Log – Segment 4.25



Photo 0949 – Facing southeast at island near EPA-C-0219.



Photo 0951 – Facing northeast at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 4.5 – MP 4.25 to 4.5

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 4.5 had moderate levels of oil staining on the extreme upstream portion of the left descending bank. There was no oil staining on the remainder of the left descending bank. In addition, the left descending shoreline/overbank areas contained areas of pooled oil, saturated vegetation, and an oil coated wetland area containing pooled oil in an area of herbaceous vegetation. The island located within the segment contained pooled oil, surface oil residue, oil staining and both oil covered vegetation and debris. The right descending shoreline had light to very light staining. In addition, the right descending shoreline/overbank contained a very small patch of oil cover at zone A (EPA-C-0369).

Actions

The shoreline clean-up activities within Segment 4.50 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Vegetation removal leaving roots intact and woody plants greater than 2" in diameter;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Mechanical removal of aquatic vegetation;
- Manual removal of oiled debris;
- Pooled oil removal;
- Scraped soil on left descending bank on the upstream end of zone B.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil and oiled herbaceous vegetation along the left descending bank in SCAT assessment zone B;
- Oiled soil along the left descending bank in SCAT assessment zone C;
- Oiled soil on the island located within the segment;
- Oiled rocks and cobbles on the right descending bank within two areas.

Segment 4.5 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill Clean-up Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank – Reassessment Conclusion Table
    - Right Descending Bank – Reassessment Conclusion Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

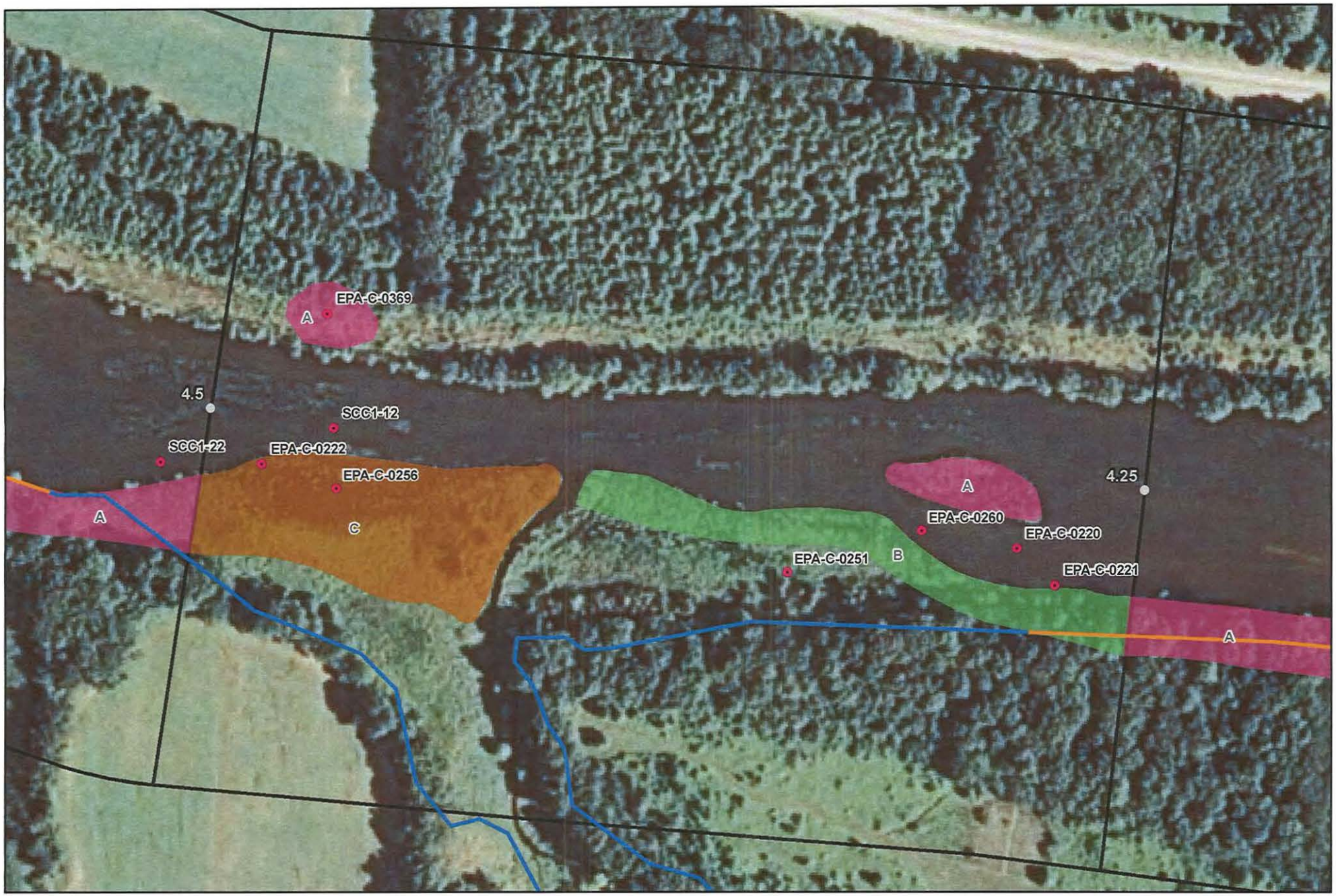
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 4.25-4.5 Left Bank While Looking Downstream									
SCC1-12	Shoreline	Shoreline Assessment	•	•			Possible Need for Skimmer		
EPA-C-0220	Shoreline/ Overbank	SCAT T1 8/25/10	Absorb pooled oil with sorbents. Minimize reentry. Consider longterm cleanup otions for affected wetland soils.					42.25980	-85.03436
EPA-C-0221	Shoreline/ Overbank	SCAT T1 8/25/10	Reccomend manual removal of vegetation with rake and flat shovel. WP045 (42.26000/85.07335) marks another spot of pooled oil.					42.25966	-85.03416
EPA-C-0222		SCAT T1 8/25/10	(refer to ote for Zone B as the second spot of pooled oil lays between Zone B and Zone C. Need to manually remove pooled oil and oiled debris with flat shovel. Also utilize absorbents. Pool is 20' x 8'. REMOVAL SHOULD BE PRIORITY.					42.26011	-85.03829





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 4.25-4.5
Left Bank While Looking Downstream

Enbridge F[illegible] Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

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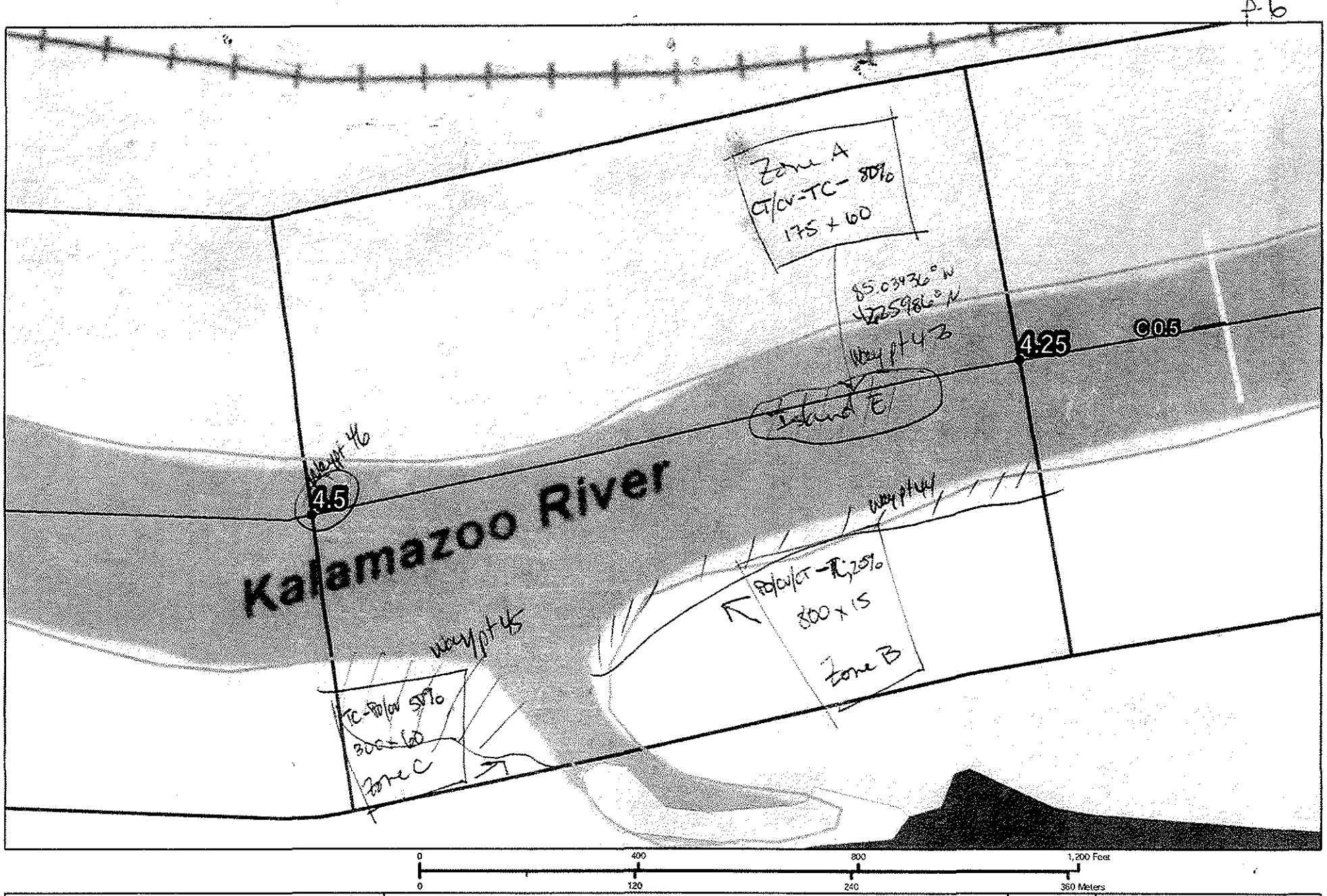
Coord[illegible] Plan

[illegible]System: NAD 1983 State [illegible]an South Feet



Shoreline
Wetlands
Emergent
Forested
Scrub/Shrub
Point Symbol

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image 2008 NAIP

SHEET # 18

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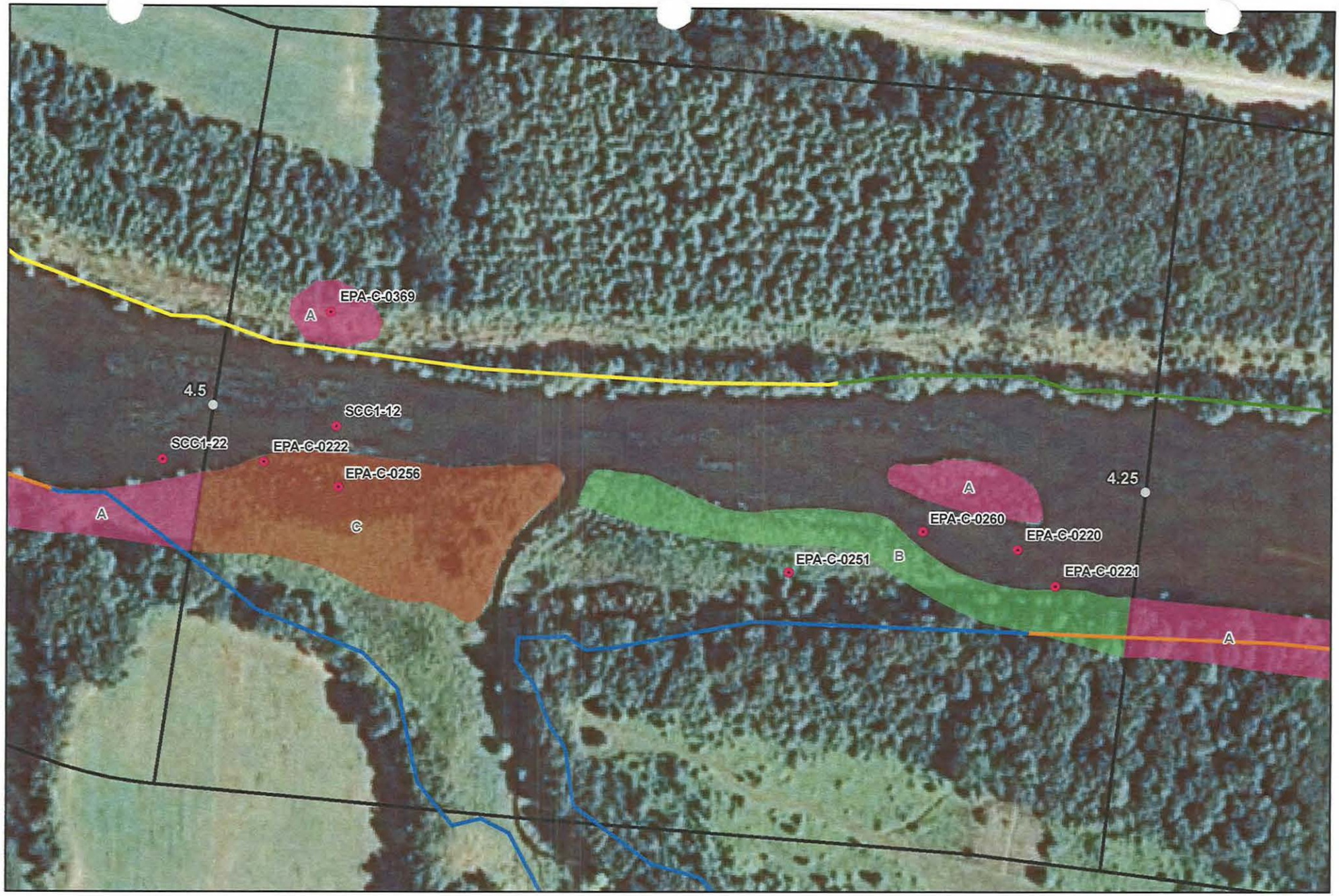
SCAT REASSESSMENT CONCLUSIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude
Division C: Mile Marker 4.25-4.5 Island									
EPA-C-0260	Island	SCAT T2 (8/15)	Pooled oil, coated wetland area, surface residue and stained areas					42.26000	-85.03500





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 4.25-4.5 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

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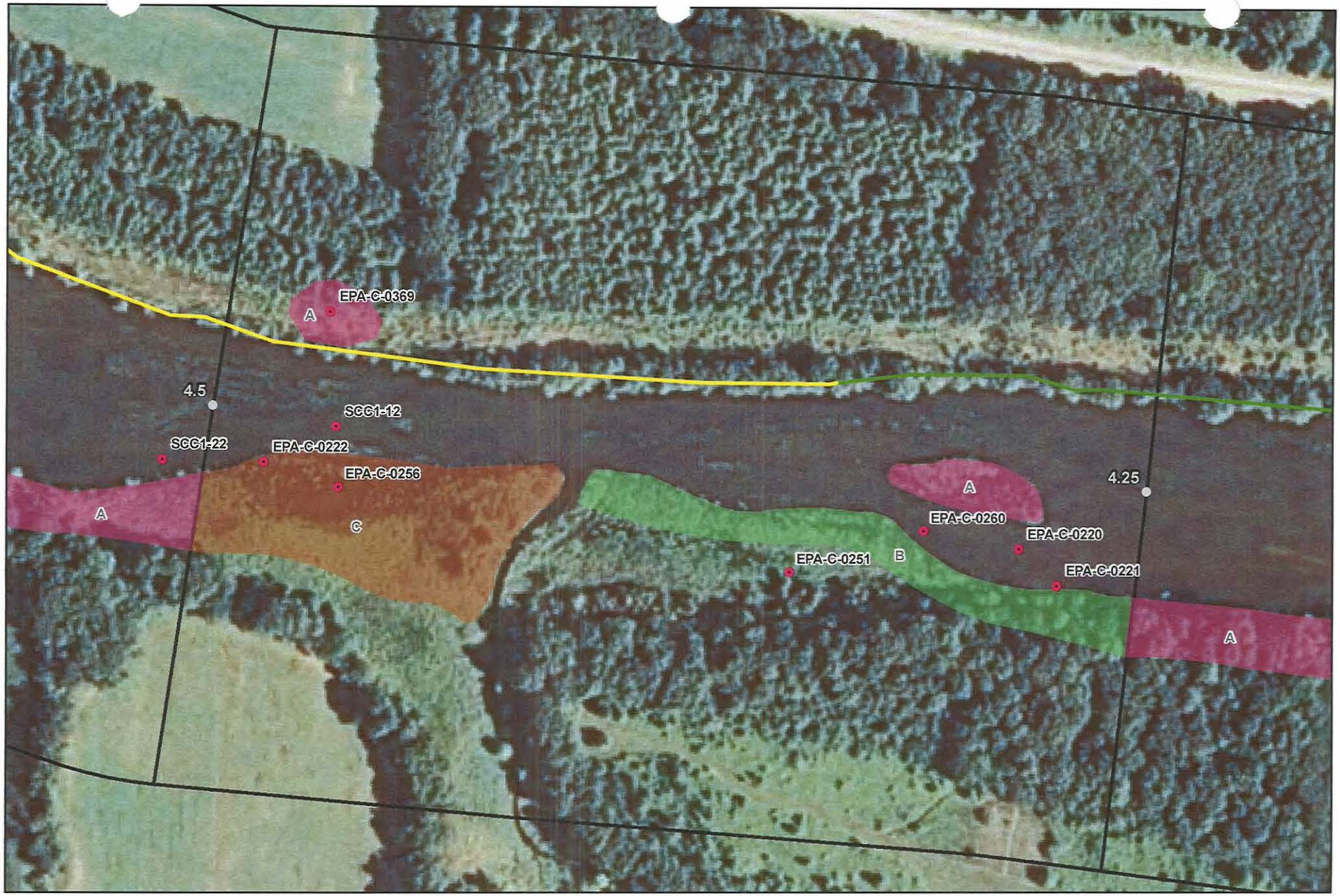
Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 4.25-4.5 Right Bank While Looking Downstream									
* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 4.25-4.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

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Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/14/10 Time: AM / PM

Operations Division: C Segment ID: From 4.25 Start MP to End MP 4.5 Segment Length: 0.25 mile

Bank: LDB / RDB ☒ Island Overbank: LOB / ROB

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

Enbridge Inspector: ELMER G TOWNER

Division Supervisor(Contractor): Doug Ballenore

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up Completed

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

clean up Completed

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

clean up completed

Revised9/01/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/14/10 **Time: AM / PM**

Operations Division: 1 **Segment ID: From** 4.25 **Start MP to End MP** 4.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Charles Strickland

Division Supervisor(Contractor): Wade Ramsey

SCAT Reviewed – Description of Clean Up Required

Recommendation are to Absorb pooled oil Shoreline/Flushing Manual Removal of vegetation By method of Raking/Shovel

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

pooled oil has been Removed, Shoreline has Been Flushed Overhanging Braches & Debris have been Removed, vegetation Removed & Island Flushed. All Spill Rems have been performed See future Recommendations Below

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Recommendations are to Allow Low areas to dry out Apply Absorbents and Remove ReSurfacing soil in areas where hand excavation method of removal has been performed

Appendix C
Step 4 – SCAT Reassessment Documentation

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 4.25-4.5 Left Bank While Looking Downstream										
SCC1-12	Shoreline	Shoreline Assessment	•	•			Possible Need for Skimmer			(Y) / N
EPA-C-0220	Shoreline/ Overbank	SCAT T1 8/25/10	Absorb pooled oil with sorbents. Minimize reentry. Consider longterm cleanup otions for affected wetland soils.					42.25980	-85.03436	(Y) / N
EPA-C-0221	Shoreline/ Overbank	SCAT T1 8/25/10	Reccomend manual removal of vegetation with rake and flat shovel. WP045 (42.26000/85.07335) marks another spot of pooled oil.					42.25966	-85.03416	(Y) / N
EPA-C-0222		SCAT T1 8/25/10	(refer to ote for Zone B as the second spot of pooled oil lays between Zone B and Zone C. Need to manually remove pooled oil and oiled debris with flat shovel. Also utilize absorbents. Pool is 20' x 8'. REMOVAL SHOULD BE PRIORITY.					42.26011	-85.03829	(Y) / N

Printed Team Members Name: James Sallee, MDNRE
Date: 9-17 Ross DELROSARIO, USEPA
Comments: Mike ZAMBETIS, ENBRIDGE

EPA-C-00251 SCAT T2 (8/15) coated wetland area, pooled oil in herbaceous areas, surface residue and stained, recommend removal of pooled oil and removal of saturated stained vegetation 42.26 -85.036 (Y) / N
EPA-C-0260 SCAT T2 (8/15) pooled oil, coated wetland area. surface residue and stained areas. Recommend removal of stained vegetation and removal of pooled oil 42. 26 -85.035 (Y) / N
Island comments are as follows: Zone A - wetland solid exhibit signs of reduced conditions, some pooled oil noted on island, .5' in depth of oil, recommend absorbed pool oil and minimize entry, consider long term cleanup options of wetland soils. (Y) / N
Zone B refers to EPA-C-0251
Zone C refers to EPA-C-0256 and 0222

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 4.25-4.5 Right Bank While Looking Downstream										
* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods										
EPA-C-0369 SCAT T3 (8/28) Very small patch of oil cover at Zone A, remaining 1/4 mile was minimally stained along rocky shoreline, but no remediation recommended, sheening with walking in water throughout section 42.2607 -85.0379 Y / N										

Team 2 9-17 James Saller, MDNRE
Ross Del Rosario, USEPA

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 4.25 to MP 4.5 Segment Length: 0.25 mile

1. **SCAT** ☒
2. **Clean up** ☐
3. **Inspection**

Signature DAVE HOOEE (date) 9/15/2010 Enbridge

Signature Eduardo Rovira (date) 9/15/10 EPA

Eduardo Rovira

4. **SCAT Reassessment**

Signature MICHAEL A. ZANNETTI (date) 9/17/10 Enbridge

Signature ROSS DEL ROSARIO (date) 9/17/10 EPA

Signature James Sallee (date) 9-17 MDNRE

5. **EPA**

Signature (date) 9/24/2010 EPA Division Supervisor

① Island "F" and "Lilly Pond" Area vic MP 4.25, (EPA C-0260 / EPA C-0251) require O&M including Periodic inspection and development of mitigation measures if oil emerges.

② Boom maintenance required periodically at Island "F", and LBD vic MP 4.25

Appendix E
Photographs

Appendix E
Photographs

Field Photo Log – Segment 4.5



Photo 0506 – Facing west at right descending bank.



Photo 0507 – Facing northwest at right descending bank.

Field Photo Log – Segment 4.5



Photo 0509 – Facing northwest at right descending.



Photo 0521 – Facing south at left descending bank near EPA-C-0222.

Field Photo Log – Segment 4.5



Photo 0522 – Facing south at left descending bank near EPA-C-0256.



Photo 0413 – Facing west at left descending bank near EPA-C-0221 and EPA-C-0222.

Field Photo Log – Segment 4.5



Photo 0414 – Facing west at left descending bank.



Photo 0415 – Facing west at Island near EPA-C-0260.

Field Photo Log – Segment 4.5



Photo 0416 – Facing west at left descending bank.



Photo 0417 – Facing east at left descending bank near EPA-C-0251.

Field Photo Log – Segment 4.5



Photo 0448 – Facing southeast at left descending bank near EPA-C-0222.



Photo 0449 – Facing south at left descending bank near EPA-C-0256.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 4.75 – MP 4.50 to 4.75

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 4.75 had moderate levels of oil staining on the left descending bank. The left descending shoreline and overbank also contained areas of oil stained soil, vegetation and debris, as well as oil coated rocks and boulders. Both islands observed in this segment contained oiled soil, vegetation and debris, as well as oil stained rocks and boulders. The right descending shoreline had light to moderate oil staining. The right descending shoreline and overbank also contained areas of oil covered vegetation which became more sporadic further downstream through the segment.

Actions

The shoreline clean-up activities within Segment 4.75 consisted of the following:

Segment 4.75 contained the end of an emergent wetland. The contractors requested direction of cleanup for this emergent wetland. The location was discussed with the Environmental Assessment Group (EAG). They determined that the current cleanup methods were appropriate.

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- High pressure wash and absorption methods on larger rocks and boulders with downstream snare and boom capture;
- Vegetation removal up to 10 feet from the waterline leaving roots intact and woody plants greater than 2 inches in diameter;
- Low hanging limbs extending over and into the water, 2 inches above oiling level were cut, bagged, and removed;
- Manual removal of oiled debris;
- Pooled oil removed in emergent wetland.

Outcome

Oil staining was not removed in some areas to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

The emergent wetland area was reviewed after completion of the cleanup recommendations. Based on groundwater seeps, it was determined further action would not preserve sensitive ecosystems and habitat. Operation and maintenance (O&M) will be implemented as necessary. O&M will likely include a booming strategy and periodic absorbent application.

- Oiled soil and oiled woody vegetation along the upper left descending bank in Zone A;
- Oiled rocks and cobbles in most areas along the lower left descending bank in Zone B;
- Oiled soil on the island.

Future recommendations are to allow islands to dry and apply absorbents on oiled surface until removed. Segment 4.75 has reached the operational endpoints for the oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill Clean-up Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials and sketch map)

    - Right Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank – Reassessment Conclusion Table
    - Right Descending Bank – Reassessment Conclusion Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 4.5-4.75 Left Bank While Looking Downstream									
SCC1-22	Shoreline	Shoreline Assessment	•	•	•	•	Possible need for skimmer	42.26012	-85.03882
EPA-C-0223	Shoreline	SCAT T1 8/25/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.Remove loose debris and rake / remove small rocks. Consider high pressure wash for large rocks and boulders.					42.26021	-85.04032





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

Division C: Mile Marker 4.5-4.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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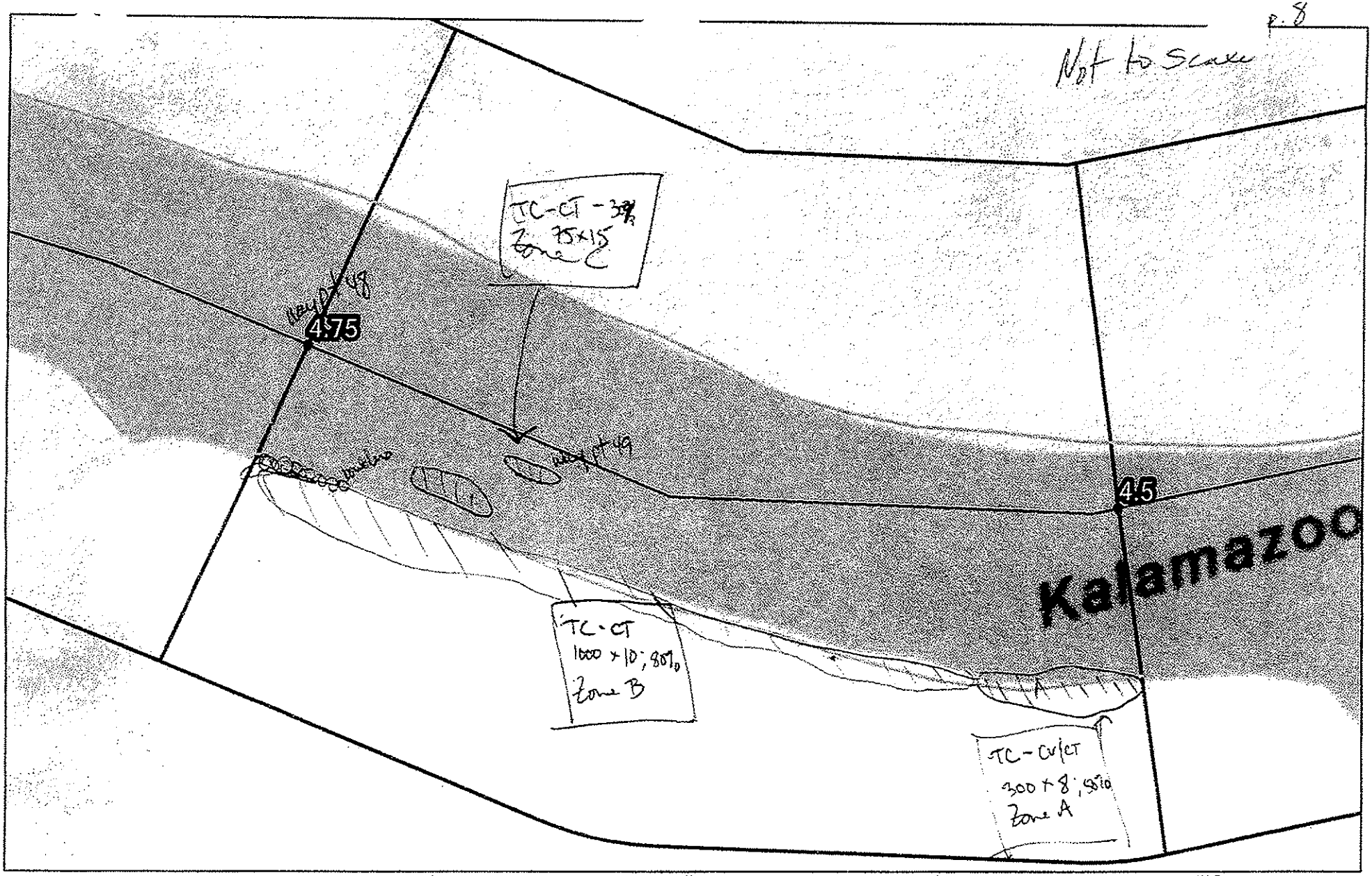
Coordinate System: NAD 1983 State Plane Michigan South Feet



Wetlands

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
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Coordinate System: NAD 1983 STATE PLANE MICHIGAN FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 4.5-4.75 Island									
EPA-C-0224	Shoreline	SCAT T1 8/25/10	Island 1. Mininmize entry. Remove woody debris and oiled vegetation. Maintain sorbent pads. Island 2 (50 feet northwest) has similar conditions/applications.					42.26067	-85.04022





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

Division C: Mile Marker 4.5-4.75 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 4.5-4.75 Right Bank Looking Downstream									
SCC1-13	Shoreline	Shoreline Assessment			•			42.26122	-85.04127





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 4.5-4.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/15/10 Time: AM / (PM)

Operations Division: C Segment ID: From 4.5 Start MP to End MP 4.75 Segment Length: 0.25 mile

Bank: (LDB) / (RDB) [X] Island Overbank: (LOB) / (ROB)

Weather: (Sun)/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: ELMER G. TANNER

Division Supervisor(Contractor): JOSHUA JEFFRIES

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

[X] SCAT Requirements/Clean Up Complete or NA

Clean Up Complete

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

[X] SCAT Requirements/Clean Up Complete or NA

Clean up Complete

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

[X] SCAT Requirements/Clean Up Complete or NA

Clean Up Complete

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

[X] SCAT Requirements/Clean Up Complete or NA

Clean up Complete

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/10 Time: AM / PM

Operations Division: #1 Segment ID: From 4.5 Start MP to End MP 4.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

Enbridge Inspector: Charles Richard

Division Supervisor(Contractor): Wade Ramaeker

SCAT Reviewed – Description of Clean Up Required

Recommendations are to Remove woody debris & vegetation from Islands, Shoreline/Matting & Shoreline vegetation Removed, Pooled oil Removed

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

Vegetation on Islands have been cut, woody debris Removed & Islands have been flagged along with Shoreline, Shoreline Vegetation has been cut, all pooled oil Identified has been absorbed, See Recommendations Below

Punchlist Items Identified

☐ Punchlist Items Complete (add check on punchlist item when completed)

All SCAT Recommendations performed, future Recommendations are to Allow to dry out & Apply Absorbents once oil Surfaces until Removed

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 4.5-4.75 Island										
EPA-C-0224	Shoreline	SCAT T1 8/25/10	Island 1. Mininmize entry. Remove woody debris and oiled vegetation. Maintain sorbent pads. Island 2 (50 feet northwest) has similar conditions/applications.					42.26067	-85.04022	(Y) / N

Printed Team Members Name:
Date: 9-17
Comments: Team not allowed to enter island. Booms surround island, per visual observation. Team agreed this area needs long-term monitoring, ~~as part of~~

EPA-C-0266 SCAT T2 (8/15) Staining approximately .5 meters on trees and shoreline, majority of rock shoreline coated, stained vegetation and oil covered debris, recommend removing oiled vegetation and debris 42.261 -85.04 (Y) / N
Zone C refers to Island area (SCC1-13 and EPA-C-0224 / 0226)
MM 9/24/10

9/17/10 Ross DelRosario, USEPA Michael Zambetis (Enbridge)
Tomes Sollee, MDNRE

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 4.5-4.75 Left Bank While Looking Downstream										
SCC1-22	Shoreline	Shoreline Assessment	•	•	•	•	Possible need for skimmer	42.26012	-85.03882	(Y) / N
EPA-C-0223	Shoreline	SCAT T1 8/25/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.Remove loose debris and rake / remove small rocks. Consider high pressure wash for large rocks and boulders.					42.26021	-85.04032	(Y) / N

Printed Team Members Name: MICHAEL ZAMBERLIN (ENSR/AECOM) Jones Sallee, MDNRE
ROSS DEL ROSARIO, USEPA
Date: 9/17/10
Comments:
↳ REFER TO SCAT RE-ASSESMENT O&M FORM FOR O&M AREA 4.75A ON LEFT DESCENDING BANK

EPA-C-0253 SCAT T2 (8/15) Staining approximately .5 meters on trees and shoreline, majority of shoreline rock is coated, stained island vegetation, oil covered debris, remove oile debris and vegetation, refers to Zone B 42.261 -85.041 (Y) / N
MR 9/24/10
Zone A refers to SCC1-22
Zone B refers to EPA-C-0223 / 253

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 4.5-4.75 Right Bank Looking Downstream										
SCC1-13	Shoreline	Shoreline Assessment			•			42.26122	-85.04127	Y / N

Printed Team Members Name: James Sallee, MDNRE, Mike Zambetis (Enbridge)
Date: 9-17
Comments:

Refer to O&M forms for this segment (Left Descending Bank & Island)

* NOTE: EPA-C-0223 ERRONEOUSLY ~~[illegible]~~ STAKED ON RDB WHEN POINT IS ACTUALLY ON THE LDB.

EPA-C-0370 SCAT T2 (8/28) Oil cover was thicker upstream and became sporadic further downstream in the zone, recommend removal of any coated vegetation in this zone 42.2613 -85.0406 Y / N
SCC1-13 is located on island Refer to Zone C

9/17/10 ROSS DEL ROSARIO, USEPA

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 4.5 **to MP** 4.75 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature DAVE HODEK 9/16/2010 (date) Enbridge

Signature Eduardo Rovira 9/16/10 (date) EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBETIS 9/17/10 (date) Enbridge

Signature ROSS DEL ROSARIO 9/17/10 (date) EPA

Signature James Sallee 9-17-10 (date) MDNRE

5. **EPA**

Signature 9-23-10 (date) EPA Division Supervisor

Boom maintenance necessary vicinity MP 4.5 and boom surrounding two small unnamed islands center river approaching MP 4.75

Appendix E
Photographs

Field Photo Log – Segment 4.75



Photo 0511 – Facing northwest at right descending bank.



Photo 0512 – Facing northwest at right descending bank.

Field Photo Log – Segment 4.75



Photo 0513 – Facing northwest at right descending bank near EPA-C-0370.



Photo 0514 – Facing northwest at right descending bank near EPA-C-0223.

Field Photo Log – Segment 4.75



Photo 0515 – Facing southeast at left descending bank.

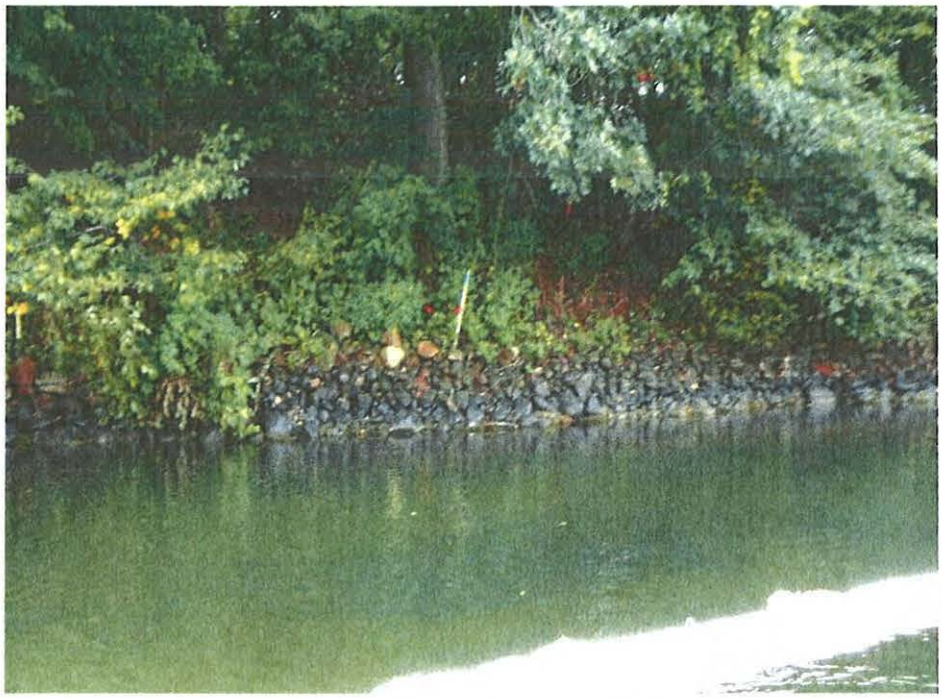


Photo 0516 – Facing south at left descending bank near EPA-C-0253.

Field Photo Log – Segment 4.75



Photo 0517 – Facing southeast at left descending bank near EPA-C-0223.



Photo 0518 – Facing north at the island near EPA-C-0224 and EPA-C-0226.



0519 – Facing south at left descending bank near EPA-C-0223.



Photo 0520 – Facing southeast at left descending bank near SCC1-22.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 5.00 – MP 4.75 to 5.00

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 5.00 had moderate oiling including oiled vegetation, oiled woody debris, tar and oiled soil on the left descending bank; and moderate oiling, including pooled oil on the right descending bank. The overbank areas contained no oil requiring clean-up and islands were absent. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 5.00 consisted of the following.

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- Removal of overhanging limbs
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Mechanical aquatic vegetation removal

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along left descending bank near EPA-C-0225
- Oiled vegetation on the right descending bank near EPA-C-0265.
- Sorbents and pom-poms are in the middle of the Segment, near EPA-C-0225 on the left descending bank, to be maintained as needed

The left descending bank in the area of EPA-C-0225 has the potential to require operation and maintenance. Recommended operation and maintenance is the installation of absorbents and booming strategy as necessary.

Segment 5.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 4.75-5 Left Bank While Looking Downstream									
SCC1-21	Shoreline	Shoreline Assessment		•			Possible need for skimmer	42.26220	-85.04408
EPA-C-0225	Shoreline	SCAT T1 8/25/10	Remove tar covered vegetation. Rake loose woody debris that is oiled. Maintain sorbents. Need to service saturated pom poms near MP 5.0. Cut and bag limbs,remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil					42.26362	-85.04680





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 4.75-5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

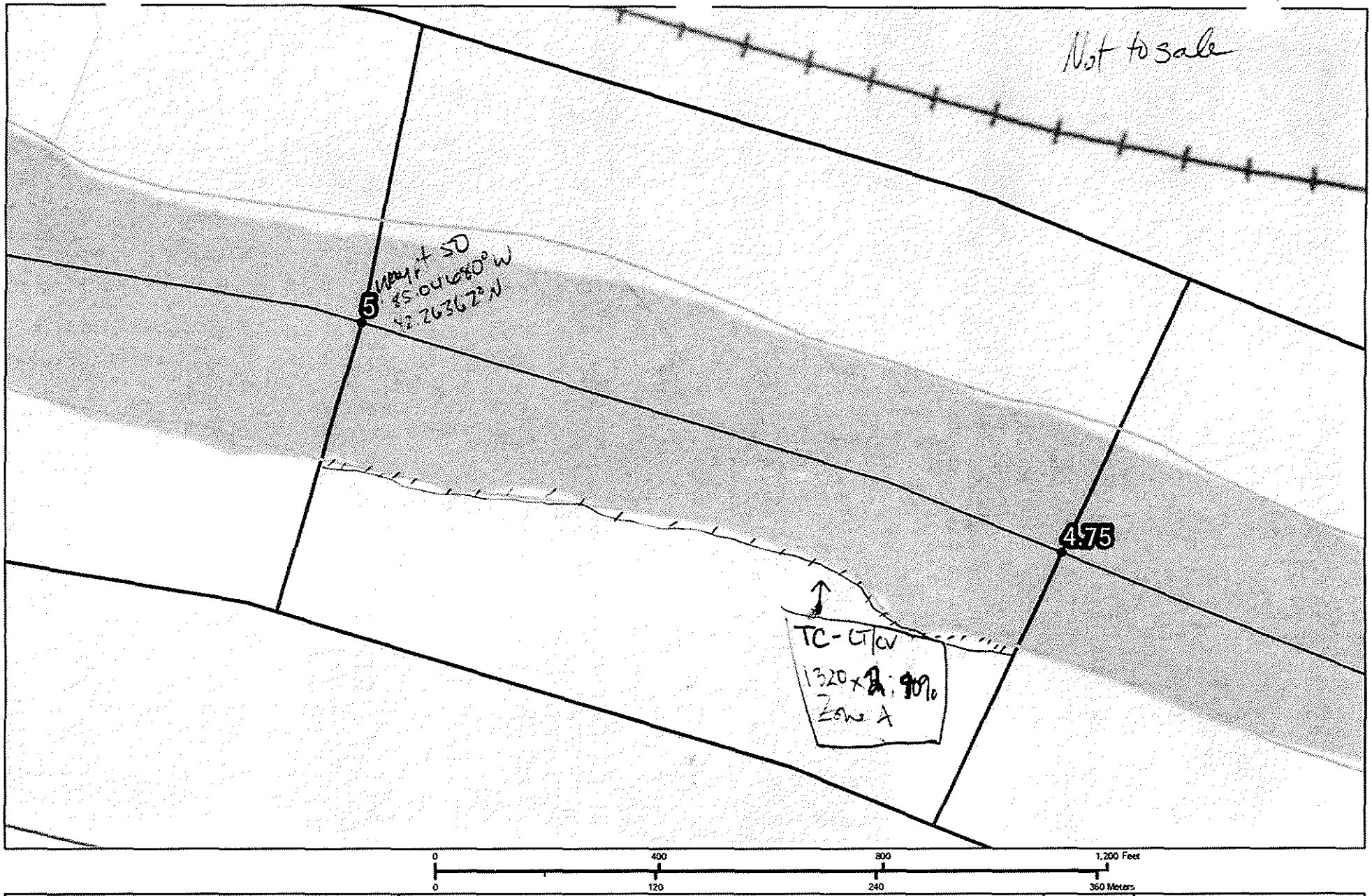
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET 48

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Division C: Mile Marker 4.75 - 5 Left Bank while looking downstream

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 4.75-5 Right Bank While Looking Downstream									
SCC1-14	Shoreline	Shoreline Assessment	•	•				42.26298	-85.04417





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 4.75-5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
CRAFT INSPECTION REPORT (CIR)

Date: 8/30/10 Time: AM / PM

Operations Division: C Segment ID: From 4.75 Start MP to End MP 5.0 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector: Ben Frings Ben Frings

Division Supervisor(Contractor): Wade Gannaway Wade Gannaway

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9/30/2010 **Time: AM / PM**

Operations Division: C **Segment ID: From** 4.75 **Start MP to End MP** 5.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

EPA Inspector:
Enbridge Inspector:
Division Supervisor(Contractor): Ed Blankenship

SCAT Reviewed – Description of Clean Up Required

Flushing and Removal of pooled oil

Clean Up Performed – Description of Clean Up Complete

☒ **SCAT Requirements/Clean Up Complete**

Flushing & Removed pooled oil

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

5.0 LDP

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 4.75-5 Left Bank While Looking Downstream										
SCC1-21	Shoreline	Shoreline Assessment		•			Possible need for skimmer	42.26220	-85.04408	(Y) / N
EPA-C-0225	Shoreline	SCAT T1 8/25/10	Remove tar covered vegetation. Rake loose woody debris that is oiled. Maintain sorbents. Need to service saturated pom poms near MP 5.0. Cut and bag limbs,remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil					42.26362	-85.04680	Per ITP. (Y) / N CC

Printed Team Members Names: Gary Andrew - EPA/Kathleen Foley - EPA/Chris Clampitt - MDNRE/Glen Vande Water - NR

Date: 09-06-10

Comments:

Oiled debris in lower ½ needs to be removed.

09-08-10: Chris Conn, Howard Phan EPA, Pamela Rice NRC/Enbridge. During second re-soat ONRE team documented a 60' x 4' affected section of shoreline that was being ~~already~~ cleaned up by a work-cre

(Tar coated shoreline, veg, roots & soil)

Work crew was using low-pressure flushing to clean areas of pooled oil, sorbent pads & booms were deployed & being changed. Also work crew was raking & hand-removing tar. Teams have completed cleanup consistent with recommendations for ID EPA-C-0225. Secondary recommendations are to maintain sorbents & pom poms in the middle of the segment as needed.

RDB - sign-off

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 4.75-5 Right Bank While Looking Downstream										
SCC1-14	Shoreline	Shoreline Assessment	•	•				42.26298	-85.04417	(Y) / N

Printed Team Members Names: Gary Andrew - EPA / Kathleen Foley - EPA / Chris Clampitt - MDNRE / Glen VandeWater - MDNRE & NRG

Date: 09-06-10

Comments:

9-8-10. No oil observed. Vegetation removal starts @ segment 4.75 and extends throughout segment 5.0, ~~throughout~~ along the shoreline, approx 10' wide.

Team members: Chris Conn, Pamela Rice, Howard Pham

DNRE Enbridge/NRG EPA

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

SCAT Reassessment Request
given to Ann Whelan 8/30/10 by KN

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 4.75 **to MP** 5.00 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK 8-30-10 (date) Enbridge

M.J. Nalepinski 30 Aug '10
Signature (date) EPA
M.J. NALEPINSKI

4. **SCAT Reassessment**

Pamela E. Rice 9-08-10
Signature (date) Enbridge
Pamela E. RICE

Howard Pham 9/8/10
Signature (date) EPA HOWARD PHAM

Chris Conn
Signature 9/8/10 (date) MDNRE

5. **EPA**

Christine Wilson 9/20/10
Signature (date) EPA Division Supervisor

Appendix E
Photographs



Photo 0279 – Looking west at left descending bank. Near SCC1-21 & EPA-C-0225.



Photo 0280 – Looking west at left descending bank. Near SCC1-21 & EPA-C-0225.



Photo 0281 – Looking west at left descending bank. Near SCC1-21 & EPA-C-0225.



Photo 0282 – Looking northeast at right descending bank. Near EPA-C-0211.



Photo 0283 – Looking east at right descending bank. Near EPA-C-0257.



Photo 0284 – Looking east at right descending bank. Near SCC1-14.



Photo 0285 – Looking east at right descending bank. Near EPA-C-0252.



Photo 0286 – Looking northeast at right descending bank. Near EPA-C-0211.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 5.25 – MP 5.00 to 5.25

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 5.25 had light to moderate oiling, including oiled debris, oiled vegetation and oiled soil on the left descending bank. The right descending bank had moderate oiling, oiled debris and oiled branches. The overbank areas contained no oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 5.25 consisted of the following.

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- Removal of overhanging limbs
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris
- Low pressure wash of rip-rap
- Mechanical aquatic vegetation removal

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along the left and right descending banks
- Oiled vegetation along the left and right descending banks. Oiled trees on right descending bank near MP 5.25

Segment 5.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flowe out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

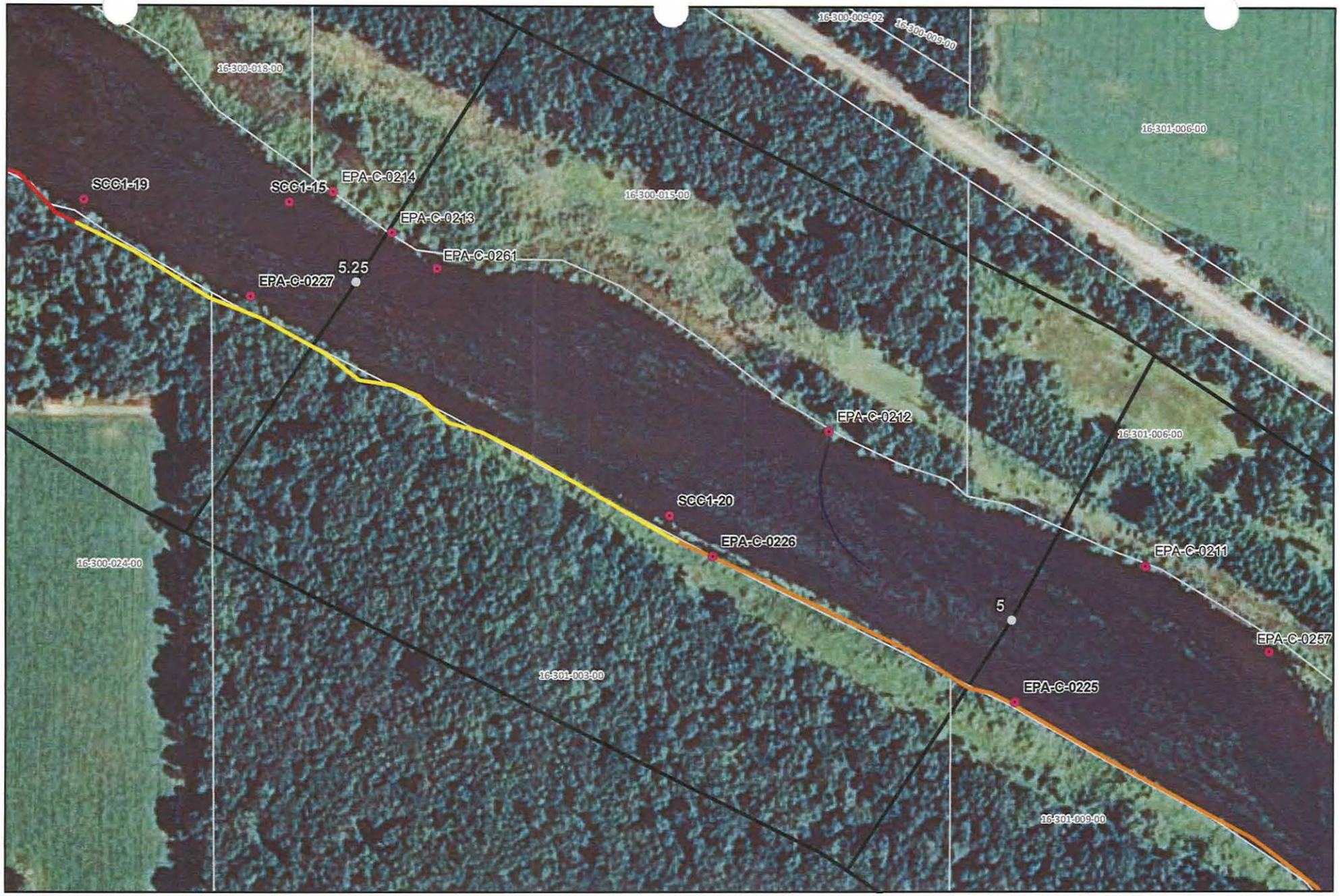
Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 5-5.25 Left Bank While Looking Downstream									
SCC1-20	Shoreline	Shoreline Assessment	●	●	?	●	Possible need for mechanical removal.	42.26452	-85.04910
EPA-C-0226	Shoreline	SCAT T1 8/25/10	emove oiled loose vegetation and oiled loose debris (grass and oiled) with a rake. Cut and bag limbs, remove oiled veg leaving roots. not remove oiled woody plants >2", no scraping, leave oiled soil.					42.26432	-85.04881





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 5-5.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

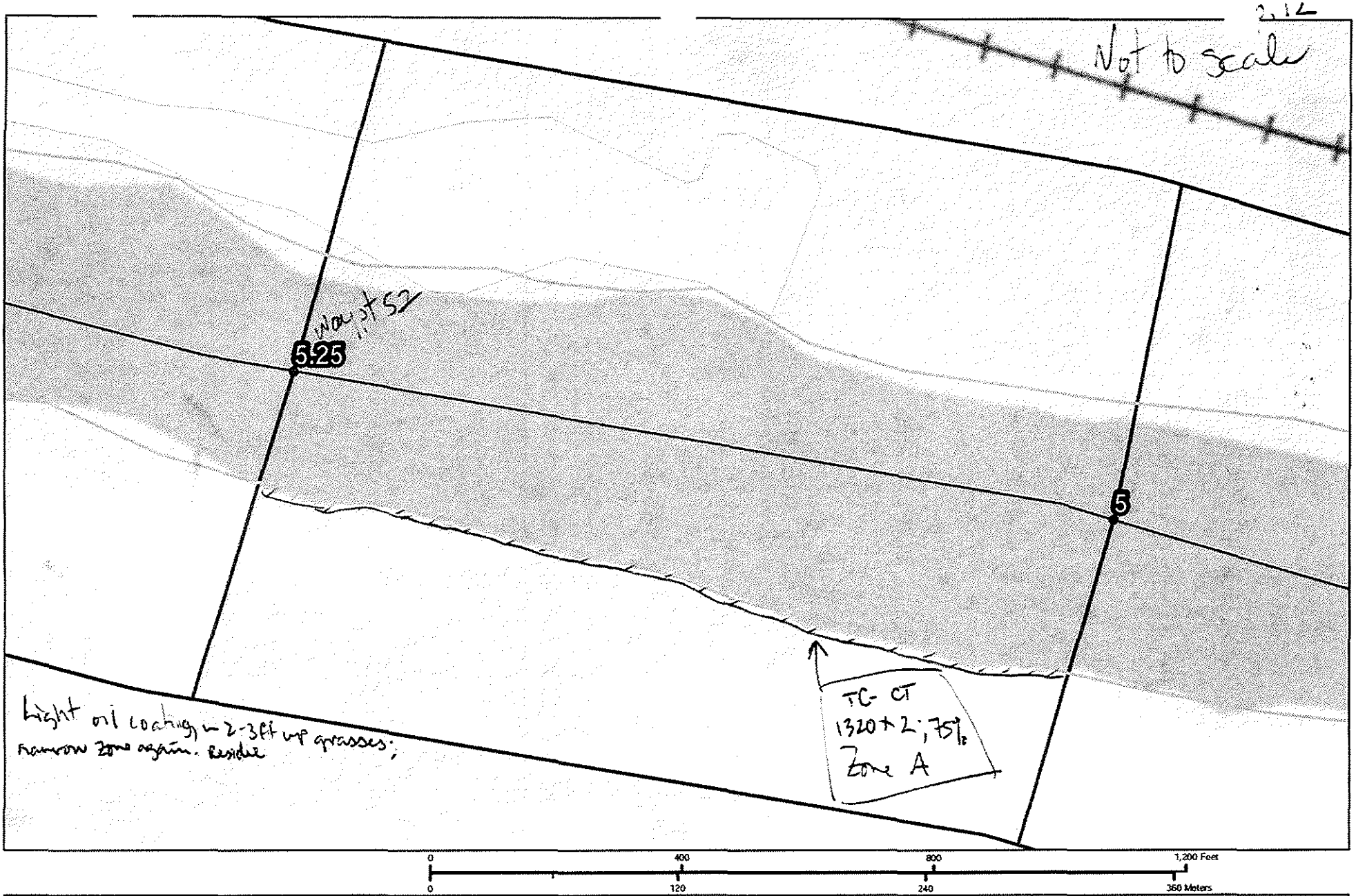
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

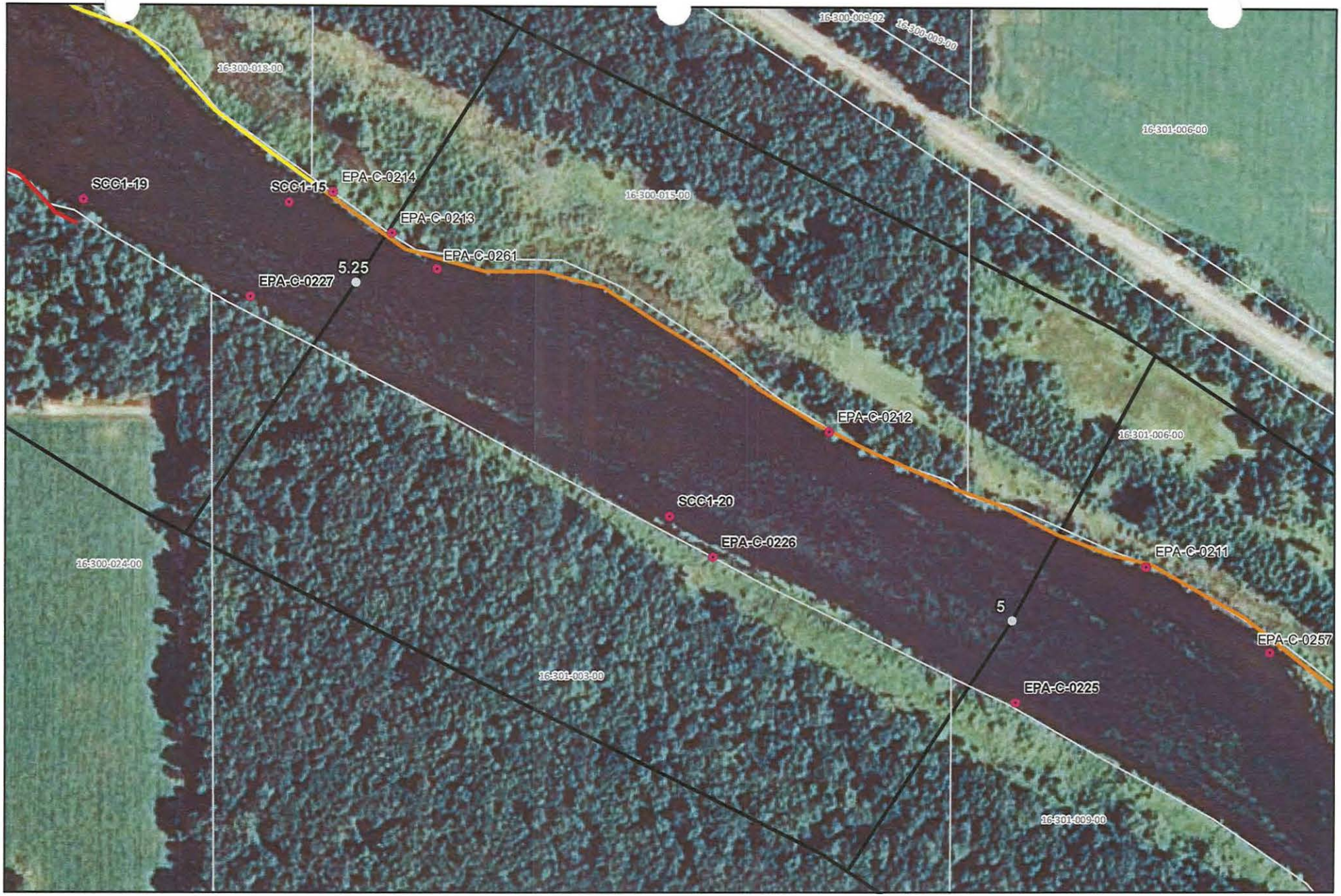
Image: 2009 NAIP

ENTRIX
Down to Earth. Down to Business.™
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Division C: Mile Marker 5 - 5.25 Left Bank while looking downstream

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 5-5.25 Right Bank While Looking Downstream									
EPA-C-0211	Main Channel	SCAT T2 8/27/2010						42.26429	-85.04594
EPA-C-0212	Main Channel	SCAT T2 8/27/2010	remove oiled debris, cut low oiled branches, low pressure was on shoreline riprap					42.264937	-85.04805





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 5-5.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

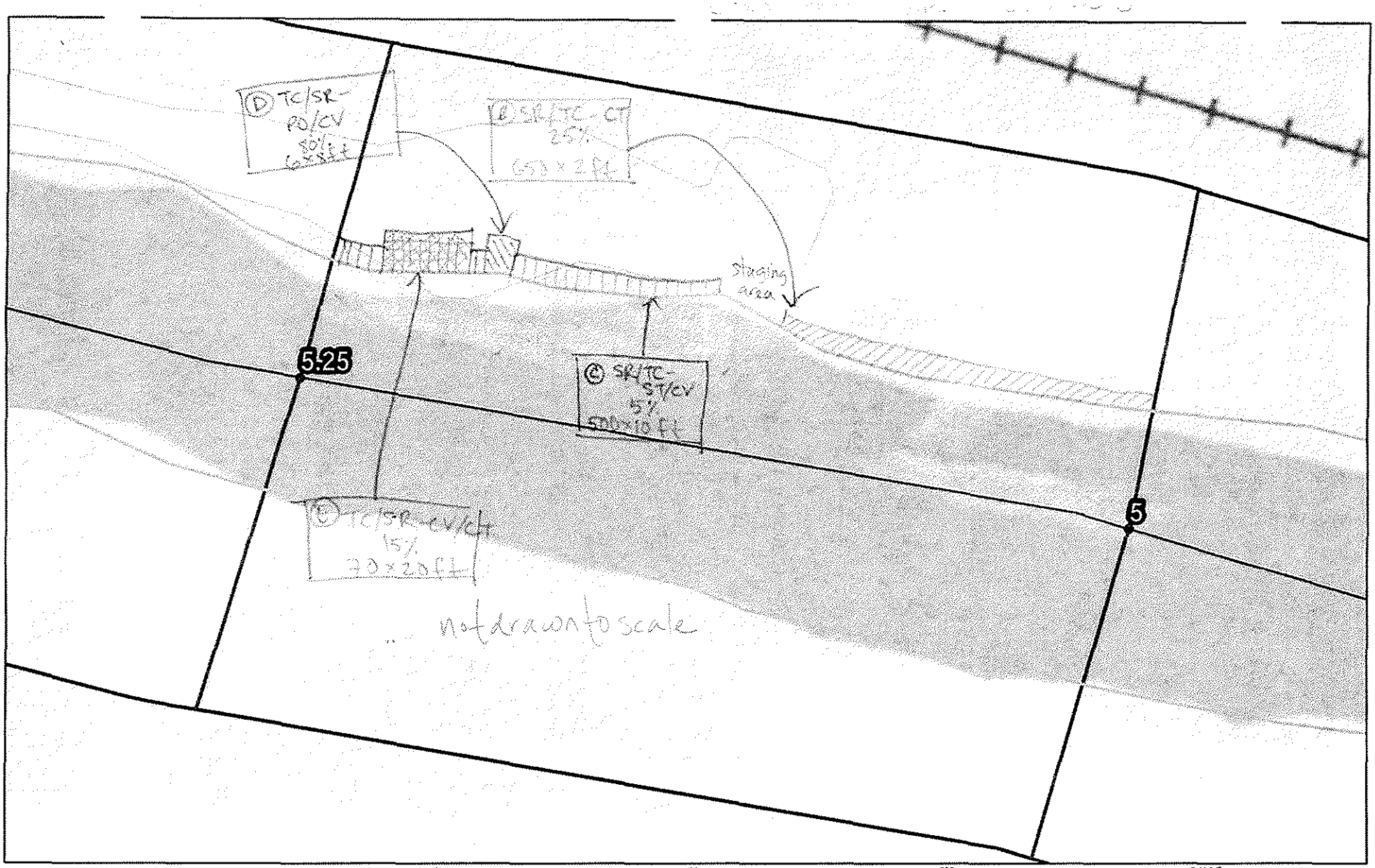
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Shoreline
Wetlands
Emergent
Forested
Scrub-Shrub
River_QuarterMiles

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Division C: Mile Marker 5 - 5.25 Right Bank while looking downstream

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 8/30/2010 **Time: AM / PM**

Operations Division: C **Segment ID: From** 5.0 **Start MP to End MP** 5.25 **Segment Length: 0.25 mile**

Bank: LDB (RDB) ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

EPA Inspector: _____

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Reviewed – Description of Clean Up Required

Oiled Debris Removal, Cut Low oiled Branches, Low Pressure Wash on Shoreline Riprap

Clean Up Performed – Description of Clean Up Complete

☒ **SCAT Requirements/Clean Up Complete**

Removed oiled Debris, Cut Low oiled Branches, Washed Rip Rap W/ low pressure along Shoreline

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 8/30/10 **Time:** AM / PM

Operations Division: C **Segment ID: From** 5.0 **Start MP to End MP** 5.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

EPA Inspector: [signature]

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

flushing, vegetation Removal, Removal of Debris, Cutting of overhanging Limbs

Clean Up Performed – Description of Clean Up Complete

☒ **SCAT Requirements/Clean Up Complete**

flushed oiled vegetation Removed, oiled Debris Removed overhanging Limbs Cut & Bagged

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS										
ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 5-5.25 Right Bank While Looking Downstream										
EPA-C-0211	42.26429	-85.0459	Main Channel	SCAT T2 8/27/2010	Refer to Kalamazoo River/Embridge Spill Cleanup Recommendation Methods					(Y) / N
EPA-C-0212	42.26494	-85.0481	Main Channel	SCAT T2 8/27/2010	Remove oiled debris, cut low oiled branches, low pressure was on shoreline riprap					(Y) / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N

SCAT REASSESSMENT CONCLUSIONS										
ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 5-5.25 Left Bank While Looking Downstream										
SCC1-20	42.26452	-85.04910	Shoreline	Shoreline Assessment	•	•	?	•	Possible need for mechanical removal.	(Y) / N
EPA-C-0226	42.26432	-85.04881	Shoreline	SCAT T1 8/25/10	Remove oiled loose vegetation and oiled loose debris (grass and oiled) with a rake. Cut and bag limbs, remove oiled veg leaving roots. not remove oiled woody plants >2", no scraping, leave oiled soil.					(Y) / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N
										Y / N

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

SCAT Reassessment - requested
given to Ann Whelan 8/30/10 by KN

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 5.00 **to MP** 5.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER KAMA 8-30-10 (date) Enbridge

Signature M. J. NALIPINSKI 30 Aug '10 (date) EPA

4. **SCAT Reassessment**

Signature 8/31/10 (date) Enbridge

Signature Wendy D.E. Drake 8/31/10 (date) EPA

Signature Shad VanDeyk 8/31/10 (date) MDNRE

5. **EPA**

Signature Christine Wagner 9/2/10 (date) EPA Division Supervisor

SCAT OK. Re-evaluate need to maintain boom at Old C-04. No sheen but catching debris

Appendix E
Photographs



Photo 0097 – Looking southeast at left descending bank. Near EPA-C-0226.



Photo 0098 – Looking northwest at left descending bank. Near EPA-C-0226.



Photo 0099 – Looking southeast at left descending bank. Near SCC1-20.



Photo 0100 – Looking northwest at left descending bank. Near SCC1-20.



Photo 0101 – Looking north by northeast at right descending bank. Near EPA-C-0261.

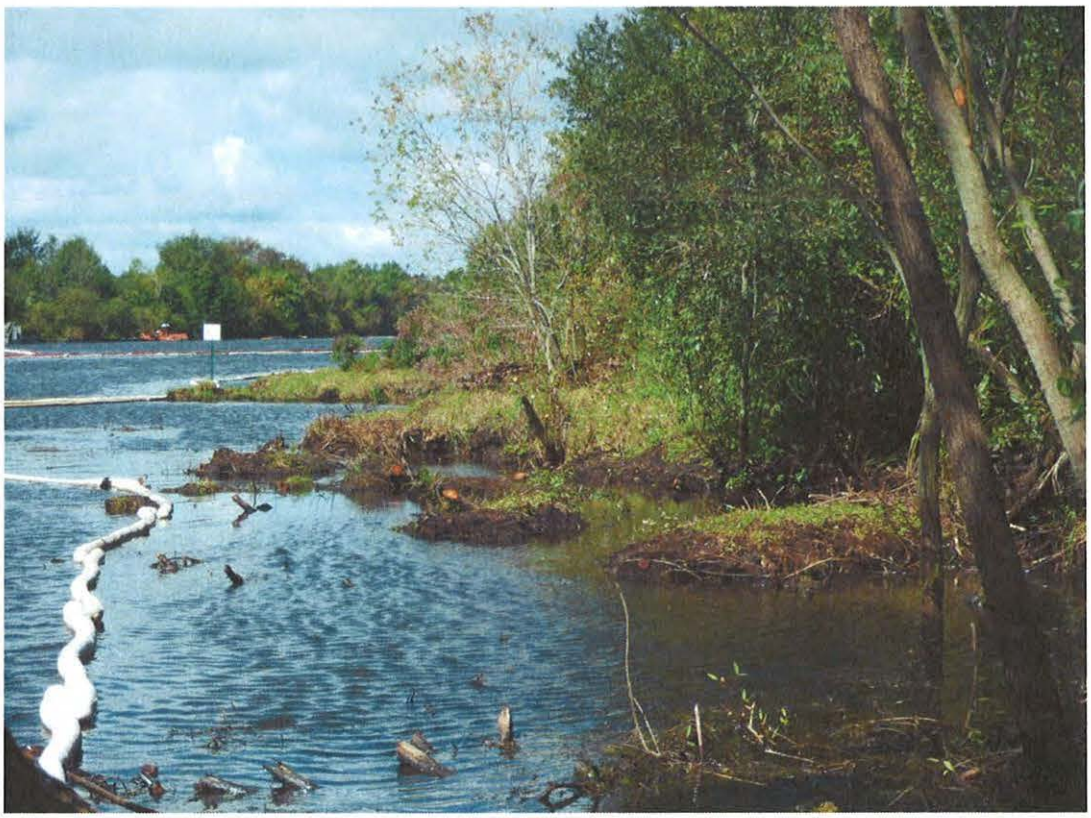


Photo 0102 – Looking northwest at right descending bank. Near EPA-C-0261.



Photo 0103 – Looking north at right descending bank. Near EPA-C-0261.

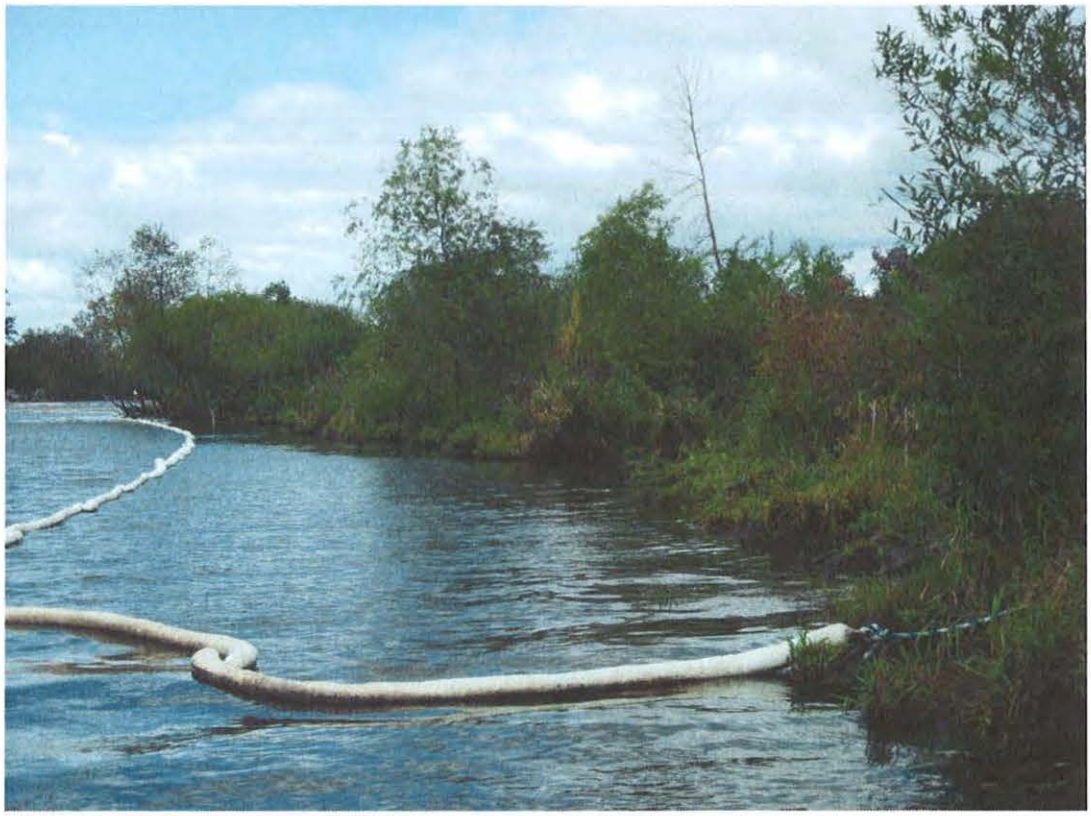


Photo 0104 – Looking northwest at right descending bank. Near EPA-C-0261.



Photo 0105 – Looking southeast at right descending bank. Near EPA-C-0261.



Photo 0106 – Looking southeast at right descending bank. Near EPA-C-0212.



Photo 0107 – Looking northwest at right descending bank.



Photo 0108 – Looking southeast at right descending bank.

Field Photo Log – Segment MP 5.25



Photo 0109 – Looking northwest. Near EPA-C-0211.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 5.5 – MP 5.25 to 5.5

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 5.5 had light levels of oil staining on the upstream portion of the left descending bank and heavy levels of oil staining further downstream. Oiled/overhanging vegetation, debris, and areas of pooled oil were observed along the shoreline and overbank of the left descending bank. In addition, the left descending bank contained areas of oiled boulders and cobble. There were no islands present within this segment. Minimal to moderate staining was present on the upstream portion of the right descending bank and light staining on the downstream portion. Oiled vegetation, debris, areas of pooled oil, and surface residue were observed along the shoreline and overbank of the right descending bank. Special consideration was mentioned for a stained wetland pond, located at EPA-C-0255, on the right descending bank.

Actions

The shoreline clean-up activities within Segment 5.5 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Vegetation removal, leaving roots intact and woody plants greater than 2" in diameter;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Manual removal of oiled debris;
- Placement of curtain boom downstream from left descending bank staging area.
- Mechanized aquatic vegetation removal

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody vegetation along the left descending bank in SCAT assessment zone A
- Oiled rock/cobble along the left descending bank in SCAT assessment zone A
- Oiled herbaceous vegetation along the right descending bank in SCAT assessment zone B
- Oiled soil along the right descending bank

Segment 5.5 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

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      - Figures (aerials and sketch map)
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      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

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  - Segment Inspection Report (SIR)

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  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

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  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

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FL	Film (transparent or iridescent sheen, or oily film)

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PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when dieturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

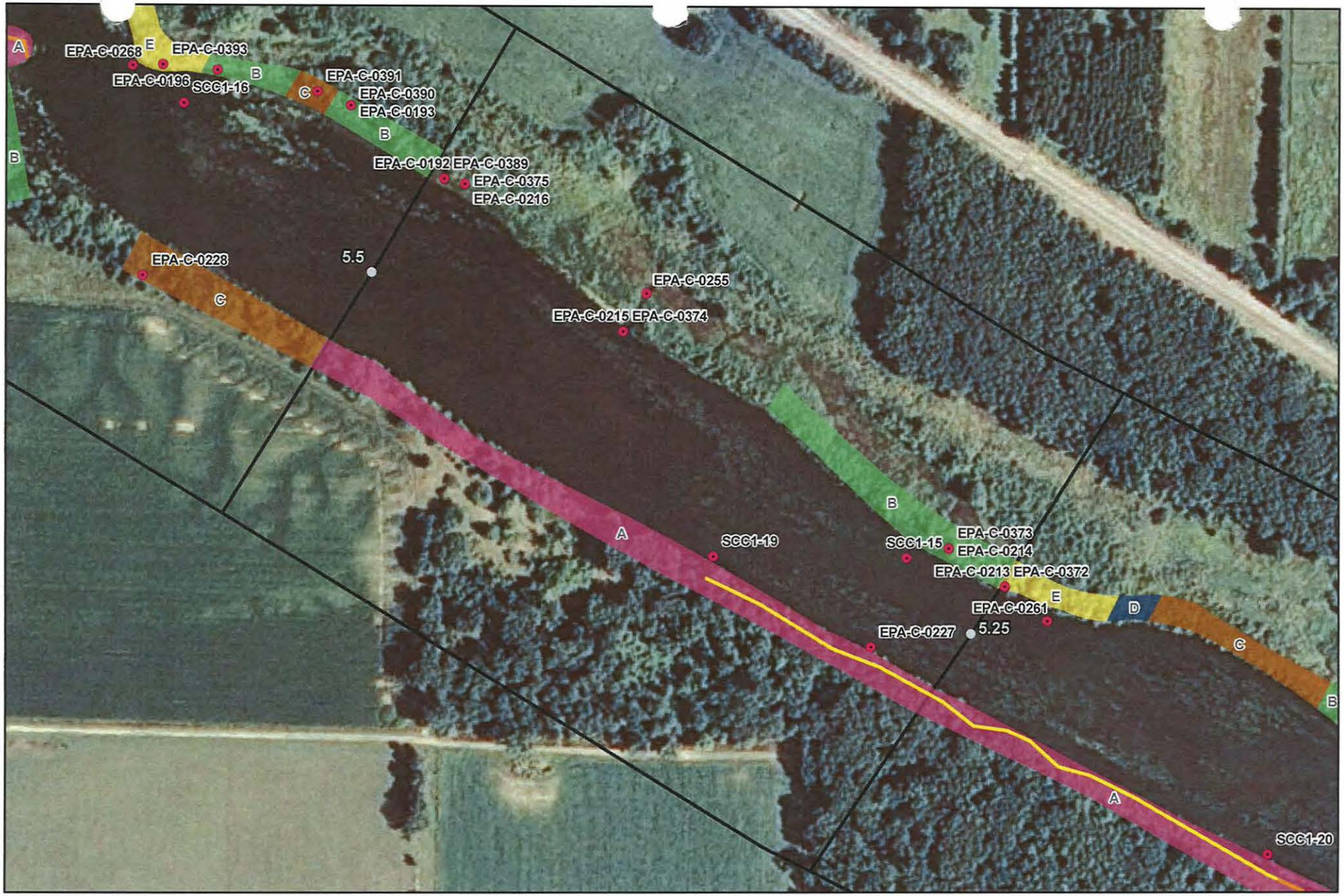
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 5.25-5.5 Left Bank While Looking Downstream									
SCC1-19	Shoreline	Shoreline Assessment	•	•				42.26603	-85.05298
EPA-C-0227	Shoreline	SCAT T1 8/25/10	Change curtain boom. Absorbant boom downstream from LDB staging area. Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.					42.26557	-85.05188





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 5.25-5.5
Left Bank While Looking Downstream

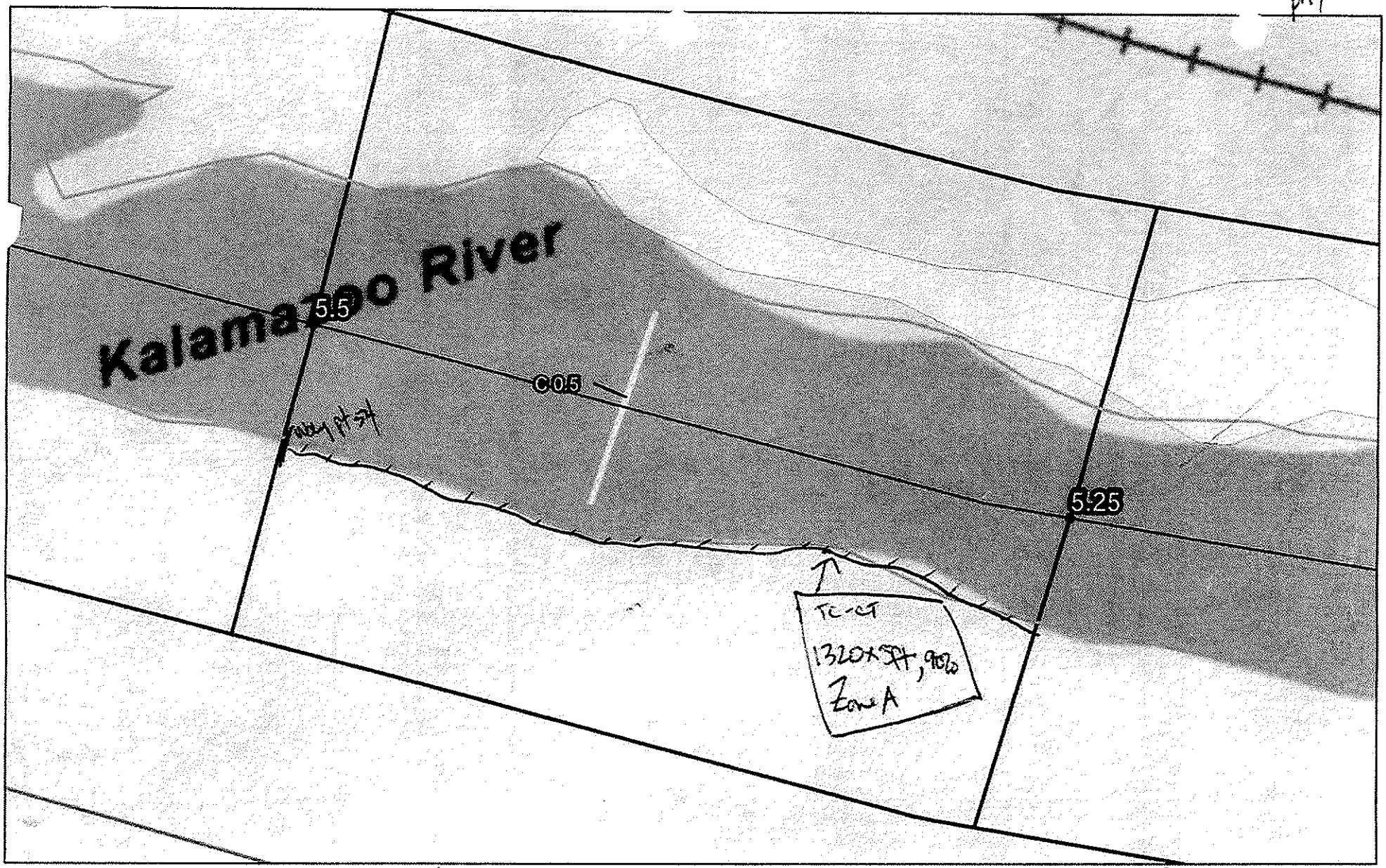
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

p.14



0 400 800 1,200 Feet

0 120 240 360 Meters

start 1610

~8ft oiled zone
boulder / cobble 100% coated 3ft upbank
oiled roots of trees

Shoreline
Wetlands
Emergent
Forested
Scrub-Shrub
River_Quadrantes

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 46

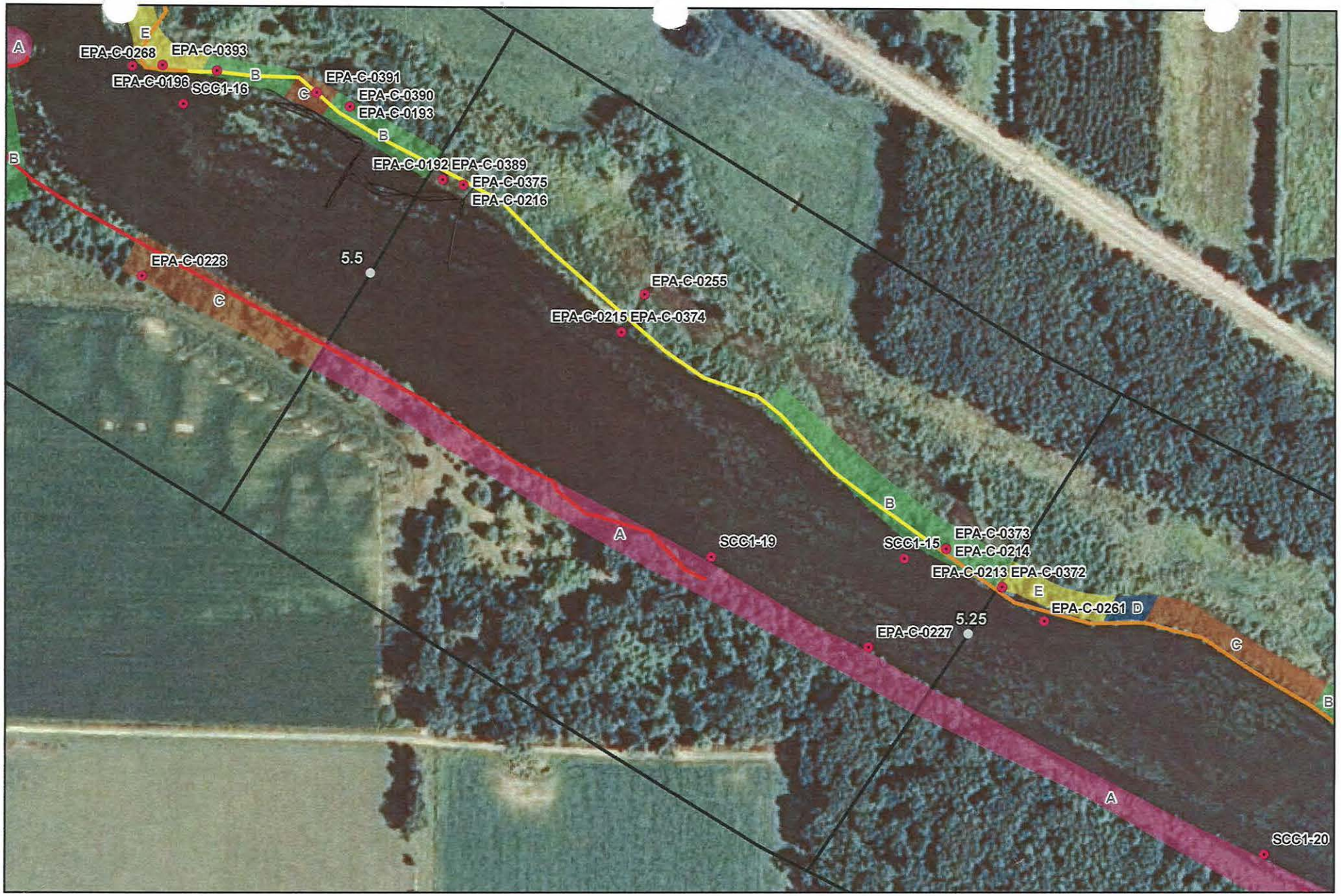
ENTRIX
Down to Earth. Down to Business.

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICH... SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 5.25-5.5 Right Bank While Looking Downstream									
SCC1-15	Shoreline	Shoreline Assessment	•	•	•	•		42.26603	-85.05163
EPA-C-0213	Shoreline	SCAT T2 8/27/2010						42.26589	-85.05095
EPA-C-0214	Shoreline	SCAT T2 8/27/2010	Remove oiled Vegetation Leaving roots. Do not remove Oiled woody plants >2"					42.26609	-85.05134
EPA-C-0215	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.2672	-85.05362
EPA-C-0216	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.26795	-85.05474





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 5.25-5.5
Right Bank While Looking Downstream

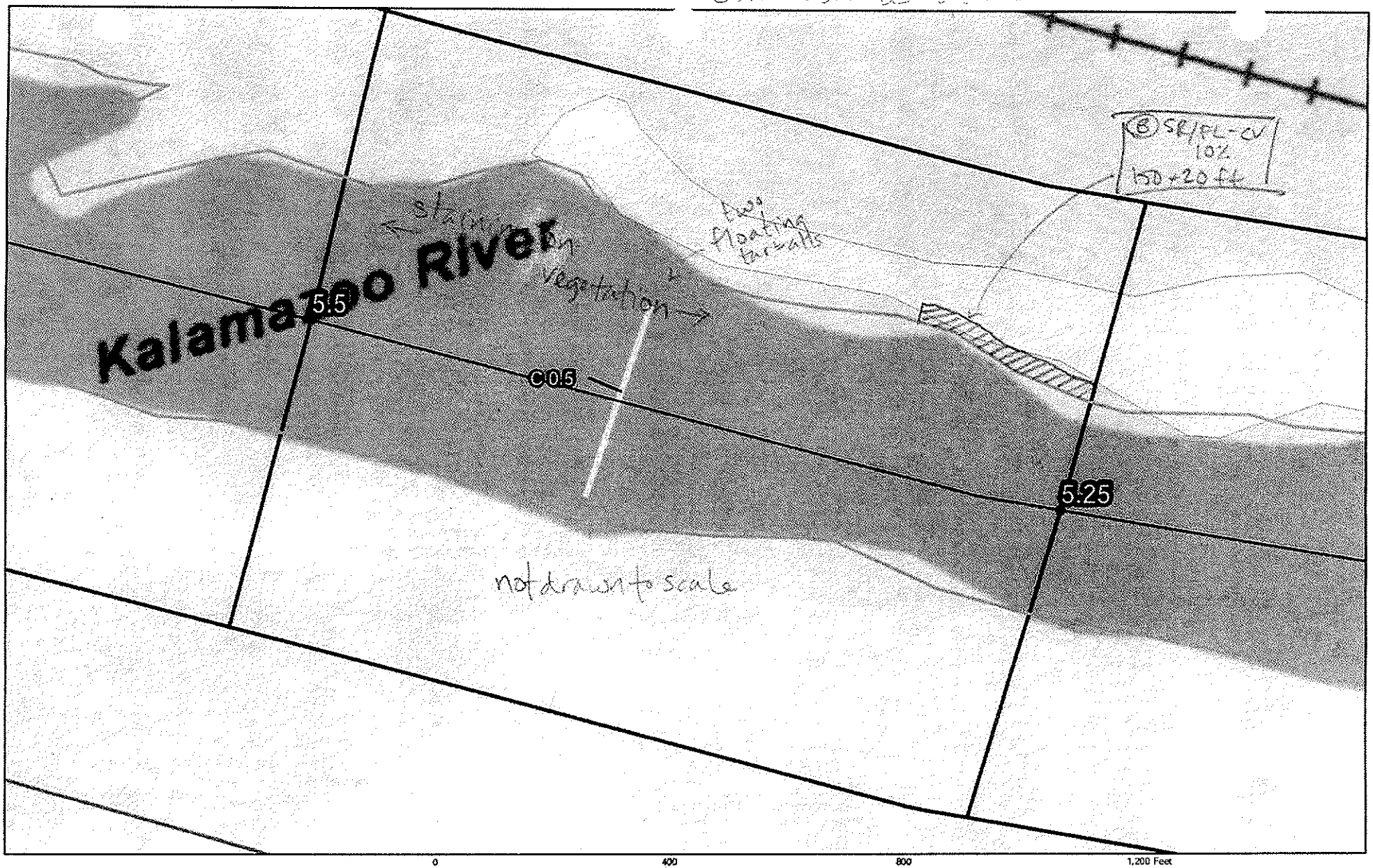
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 48

ENTRIX
Down to Earth. Down to Business.

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/15/10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 5.25 **Start MP to End MP** 5.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank:** LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: ELMER GUY TOWNER

Division Supervisor(Contractor): JOSHUA JEFFERIES

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean up Complete

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean Up Complete

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean Up Complete

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean Up Complete

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/15 **Time: AM / PM**

Operations Division: 1 **Segment ID: From** 5.25 **Start MP to End MP** 5.50 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor): Wade Hannaway

SCAT Reviewed – Description of Clean Up Required

Recommendations are to flushing, pooled oil Removal, Removal of vegetation & Debris

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Shoreline has been flushed, pooled oil removed, vegetation cut & removed along with debris removed
All SCAT recommendations have been performed

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 5.25-5.5 Left Bank While Looking Downstream										
SCC1-19	Shoreline	Shoreline Assessment	•	•				42.26603	-85.05298	(Y) / N
EPA-C-0227	Shoreline	SCAT T1 8/25/10	Change curtain boom. Absorbant boom downstream from LDB staging area. Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.					42.26557	-85.05188	(Y) / N

Printed Team Members Name: MICHAEL ZAMBETTO
Date: 9/17/10
Comments: ROSS DEL ROSARIO, USEPA
James Sollee, MDNRE

Zone A refers to SCC1-19 and EPA-C-0227

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 5.25-5.5 Right Bank While Looking Downstream										
SCC1-15	Shoreline	Shoreline Assessment	•	•	•	•		42.26603	-85.05163	(Y) / N
EPA-C-0213	Shoreline	SCAT T2 8/27/2010						42.26589	-85.05095	(Y) / N
EPA-C-0214	Shoreline	SCAT T2 8/27/2010	Remove oiled Vegetation Leaving roots. Do not remove Oiled woody plants >2"					42.26609	-85.05134	(Y) / N
EPA-C-0215	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.2672	-85.05362	(Y) / N
EPA-C-0216	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.26795	-85.05474	(Y) / N

Printed Team Members Name: James Sallee, MDNRE, Michael Zambetis (Enbridge) Ross Del Rosario, USEPA

Date: 9-17

Comments:

Refer to OOM sheet for EPA-C-0389.

EPA-C-0255 SCAT T2 (8/15) Stained wetland pond, covered shoreline, surface residue 42.267 -85.053 (Y) / N

EPA-C-0192 is located in the SCAT assessment recommendatioins table for segment 5.75 and will be confirmed as such

EPA-C-0373 SCAT T2 (8/28) Walking in river stirred up sediments with oil flakes and sheen, staining on shoreline vegetation, no further cleanup needed 42.26608 -85.051343 (Y)/N

EPA-C-0374 SCAT T2 (8/28) Walking in river stirred up sediments with oil flakes and sheen, staining on shoreline vegetation, submerged pom poms to remove/replace 42.26719 -85.05362 (Y)/N Inspected 9/21. No pom-poms.

EPA-C-0375 SCAT T2 (8/28) Walking in river stirred up sediments with oil flakes and sheen, staining on shoreline vegetation 42.26795 -85.05474 (Y)/N

EPA-C-0389 SCAT T2 (8/28) Sheen observed on surface of the water close to shoreline. Sheen was present prior to agitation by field team. Recommend placing absorbent pads and new boom. Booms in segment need to be pulled and replaced 42.26797 -85.05488 (Y)/N

Zone B refers to EPA-C-0214, EPA-C-0373, and SCC 1-15

JS Yes - absorbent pads placed

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 5.25 to MP 5.50 Segment Length: 0.25 mile

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Dave Hodek 9/17/10 Enbridge
Signature (date)
(DAVE HODEK)

Eduardo Rovira 9/17/10 EPA
Signature (date)
Eduardo Rovira

4. **SCAT Reassessment**

M. O'Donnell 9/17/10 Enbridge
Signature (date)

R. del Rosario 9/17/10 EPA
Signature (date)
ROSS DEL ROSARIO

James Sallee 9/17/10 MDNRE
Signature (date)
James Sallee

5. **EPA**

Christine Wagner 9/21/10 EPA Division Supervisor
Signature (date)

Sorbent boom removal, done 9/22/10

Include sorbent boom maintenance in area downstream of hard boom

Appendix E
Photographs



Photo 418 – Facing northwest at right descending bank near EPA-C-0213.



Photo 419 – Facing northwest at right descending bank near EPA-C-0214.

Field Photo Log – Segment 5.5



Photo 420 – Facing northwest at right descending bank.



Photo 421 – Facing north at right descending bank near EPA-C-0255/EPA-C-0215.

Field Photo Log – Segment 5.5



Photo 423 – Facing north at right descending bank EPA-C-0375/EPA-C-0216.



Photo 442 – Facing southwest at left descending bank near SCC1-27



Photo 443 – Facing southwest at left descending bank.



Photo 444 – Facing southeast at left descending bank.



Photo 445 – Facing southeast at left descending bank near SCC1-19.



Photo 446 – Facing south at left descending bank near EPA-C-0227.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 5.75– MP 5.5 to 5.75

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 5.75 had heavy to moderate levels of oil staining, along with overhanging vegetation on the left descending bank. There were no operational focus areas observed on the left descending overbank. No islands were present in this segment of the river. The right descending bank contains small intermittent oil and tar pools, light to moderate levels of staining, and sheen within aquatic vegetation near shore. Also, rip rap and lawns in a residential area contain oil staining and floating oil along the right descending bank. Right descending overbank contained a small wetland pond with oil sheen.

Actions

The shoreline clean-up activities within Segment 5.75 consisted of the following:

- Low pressure / high volume flush with downstream snare and boom capture. Re-flush was also completed on raked lawns;
- Pooled oil removal through vacuum and absorption methods;
- High pressure/cold water wash on larger rocks and boulders.
- Vegetation removal along the shoreline leaving woody plants greater than 2 inches in diameter;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Manual removal of oiled debris;
- Removal of oil stained residential lawn.
- Mechanical removal of aquatic vegetation.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled rock/cobble in Zone A and just upstream of Zone B;
- Oiled soil on left descending bank;
- Oiled rock/cobble, soil, and herbaceous vegetation in zone E along right descending bank.

Segment 5.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill Clean-up Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials)

    - Right Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials)

- **Appendix B: Step 2 Clean-up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank – Reassessment Conclusion Table
    - Right Descending Bank – Reassessment Conclusion Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 5.5-5.75 Left Bank While Looking Downstream									
EPA-C-0203	Shoreline/ Overbank	SCAT T2 8/27/2010						42.26913	-85.05987
EPA-C-0205	Shoreline	SCAT T2 8/27/2010	complete current effort and re-assess					42.2683	-85.05839
EPA-C-0228	Shoreline	SCAT T1 8/26/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.					42.26746	-85.05697





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 5.5-5.75
Left Bank While Looking Downstream

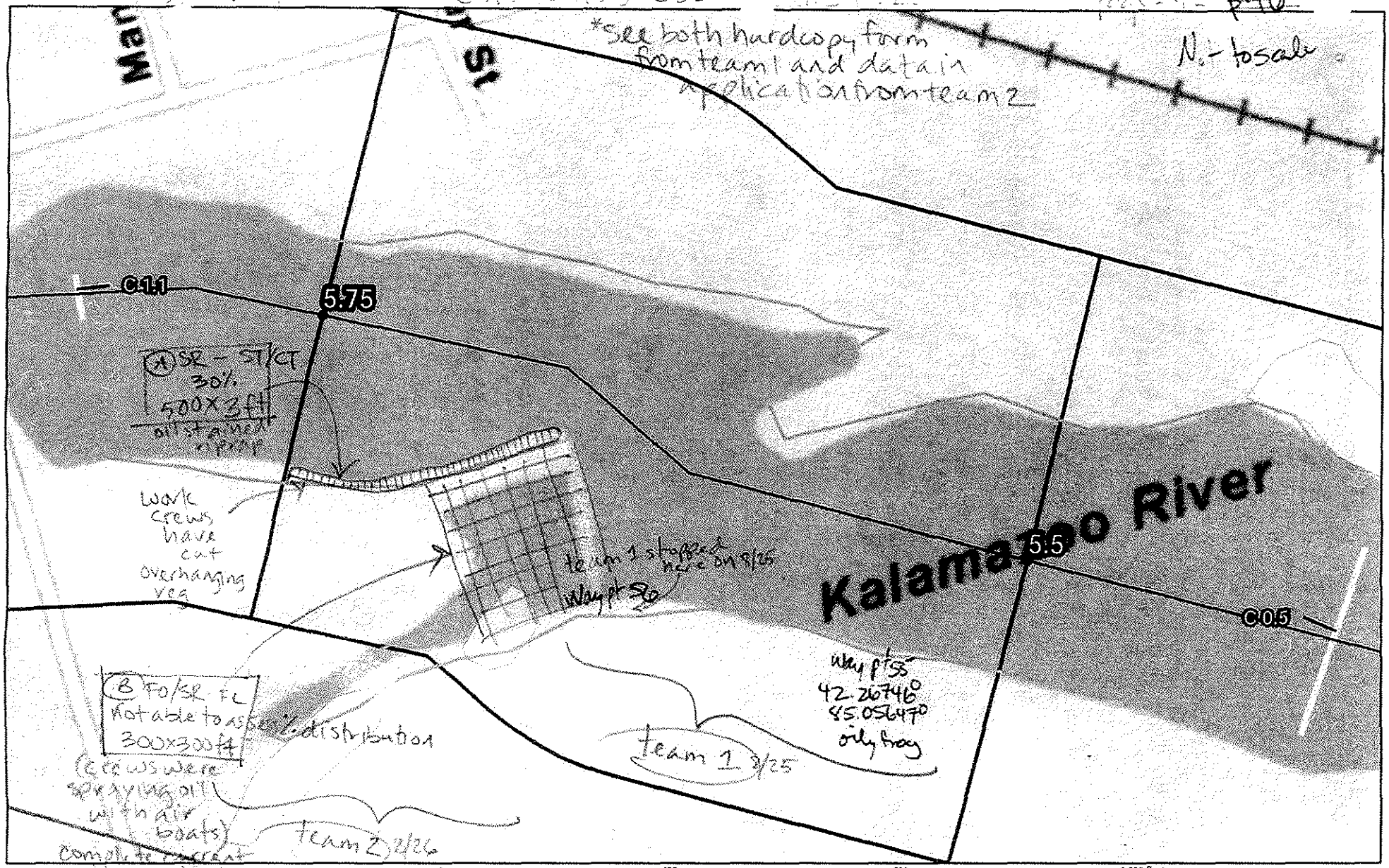
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



grass bank 1 ft up oiled, overbank forest.
Disturbed sediment releases much oily film.
Zone A 6-8 ft wide, 660 ft L
50 fm + 50% - Bits of oiled veget

Shoreline
Wetlands
Emergent
Forested
Scrub-Shrub
River_Quarterlines

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

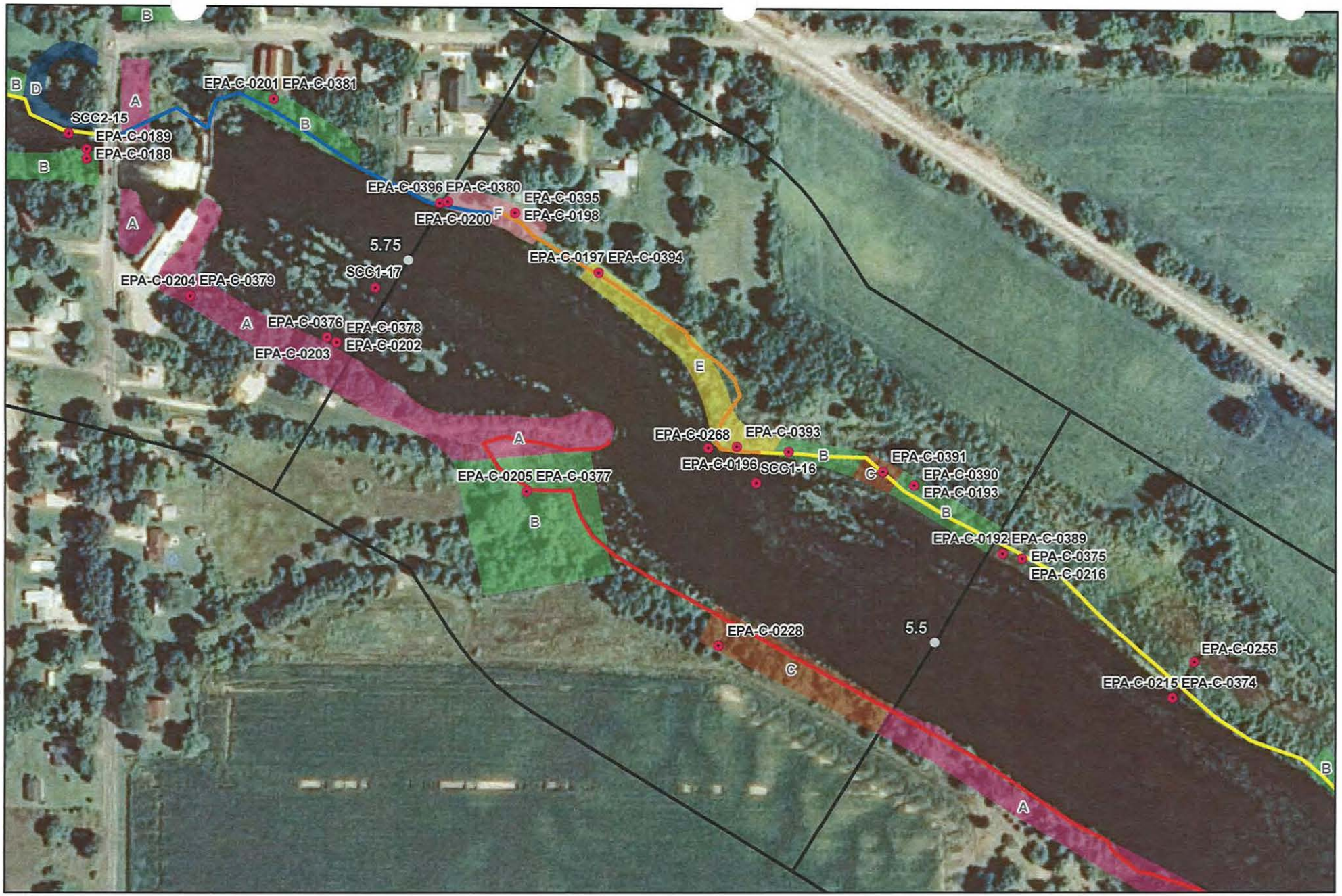
SHEET #: 46

ENTRIX
Down to Earth, Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 5.5-5.75 Right Bank While Looking Downstream									
SCC1-16	Shoreline	Shoreline Assessment	•	•	•	•		42.26835	-85.05670
EPA-C-0192	Shoreline	SCAT T2 8/27/2010						42.26798	-85.05488
EPA-C-0193	Shoreline	SCAT T2 8/27/2010	Minimize Entry. Sheen could possibly be from oiled vegetation, the sheen is staying close to the shore because of the booms and pom poms. zone B encompasses zone C. photo 0003 is of oiled emergent vegetation.					42.26835	-85.05554
EPA-C-0194	Shoreline	SCAT T2 8/27/2010	Minimize Entry. fresh pooled oil and some tar along shoreline. oil should vaccuumed out and absorbed. causing sheen. Area is located within zon B, this small area just had different characteristics and was made a zone itself. photo 0005 is of pooled oil.					42.26842	-85.05577
EPA-C-0195	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.26852	-85.05647
EPA-C-0196	Shoreline	SCAT T2 8/27/2010	Rocky riprap was at the eastern most front of the zone. riprap could easily be low pressure washed. some oily debris was also present on east side boom. the rest of the zone was emergent wetlands that had coated and stained vegetation. lots of spots of floating fresh oil. epa concerned that oiled veg will produce sheen, dnre staff feels the wetland should be left alone and work to retrieve oil in					42.26855	-85.05685
EPA-C-0197	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.2695	-85.05788
EPA-C-0198	Shoreline	SCAT T2 8/27/2010	Remove sod Replace. Small pockets of pooled oil along shoreline in front of residential houses needs o be absorbed. whole entire shoreline in residential area needs to be cleaned better. tar and surface residue still present on lawns. citizen contacted team and expressed concerns about lack of clean up along shoreline on his property. photo 0008 is of floating oil in front of residence. photo 0009 is of oiled grass in front of residence.					42.26982	-85.0585
EPA-C-0199	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.26987	-85.05905





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 5.5-5.75
Right Bank While Looking Downstream

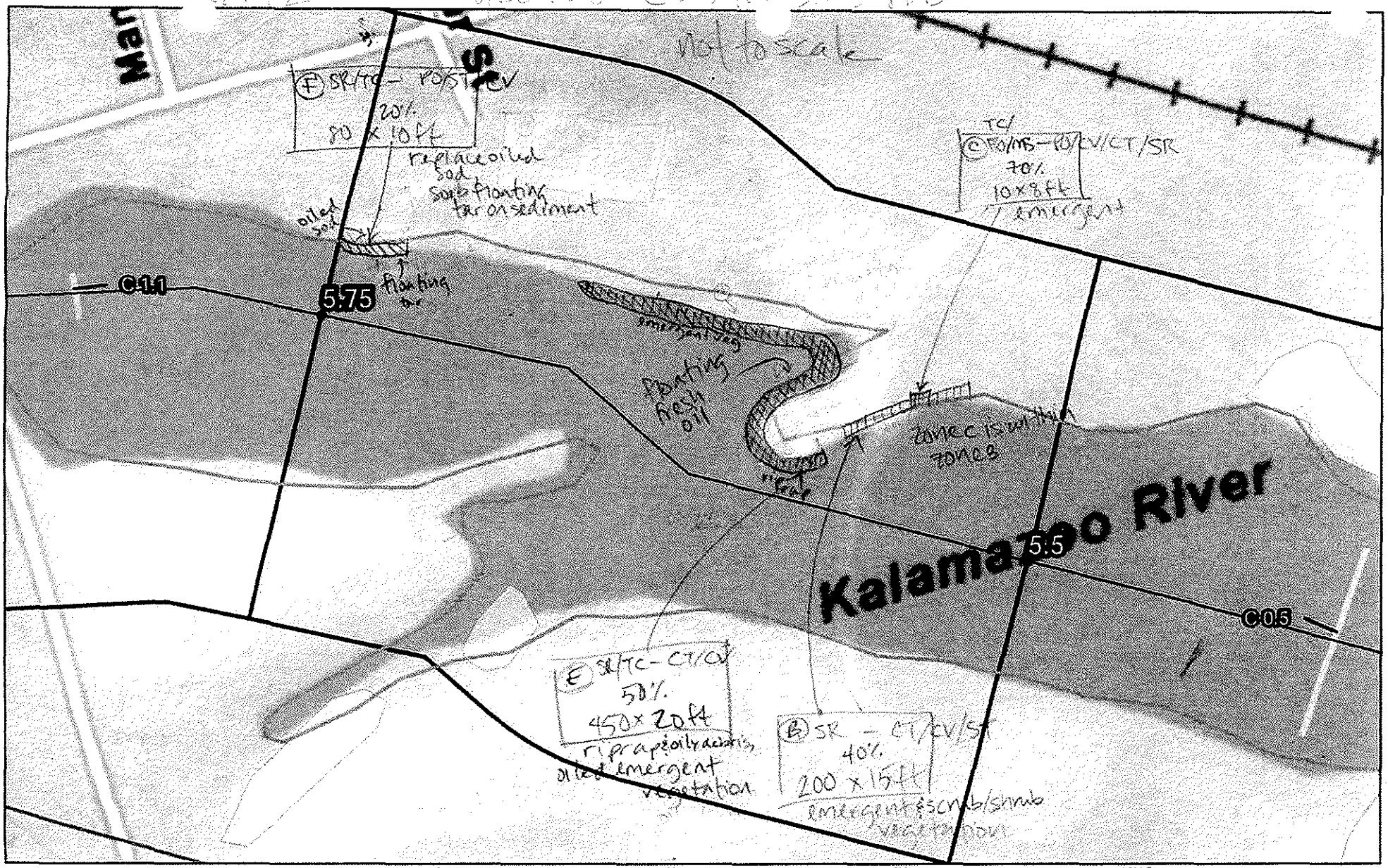
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Shoreline
Wetlands
Emergent
Forested
Scrub-Shrub
River_Outline

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 48

ENTRIX
Down to Earth, Down to Business
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIG[illegible]TH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/15/10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 5.5 **Start MP to End MP** 5.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank:** LOB / ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: ELMER GUY TOWNER

Division Supervisor(Contractor): JOSHUA JEFFRIES

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean up Complete

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean Up Complete

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean Up Complete

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean up Complete

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/15/10 **Time: AM / PM**

Operations Division: 1 **Segment ID: From** 5.5 **Start MP to End MP** 5.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Charley Strickland

Division Supervisor(Contractor): Wade Ramsey

SCAT Reviewed – Description of Clean Up Required

Recommendations were to flush, pooled oil Removal Removal of oily vegetation & Debris, High pressure cold water flush of Larger Rocks & Boulders Removal of Tar & Surface Residue Scrape

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

all SCAT Requirements have been met. Cleanup has been completed all oily overhanging vegetation has been cut, bagged & Removed. Oily Veg. Cut & oiley debris Removed. Larger Rocks & Boulders have been pressure washed, Shoreline Raked & Re-flushed

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 5.5-5.75 Left Bank While Looking Downstream										
EPA-C-0205	Shoreline	SCAT T2 8/27/2010	complete current effort and re-assess					42.2683	-85.05839	(Y) N
EPA-C-0228	Shoreline	SCAT T1 8/26/10	Cut and bag limbs, remove oiled veg leaving roots. Do not remove oiled woody plants >2", no scraping, leave oiled soil.					42.26746	-85.05697	(Y)/ N

Printed Team Members Name: ROSS DEL ROSARIO, USEPA, MIKE ZAMBETIS (ENBRIDGE) James Sallee, MDNRE

Date: 9-17-10

Comments: * EPA-C-0205 - CONTINUE BOOM MAINTENANCE IN O&M PHASE

EPA-C-0377 NA area totally disturbed from ongoing cleanup effort, crew spraying oil with airboats, % of impact undeterminable, should be investigated to determine if any further action is required. 42.26829 -85.05838 (Y)/ N

Zone A has oil stained rip rap, please refer to Kalamazoo Enbridge Oil Cleanup Methods (Y)/ N

Zone B refers to EPA-C-0377 and 205

Zone C refers to EPA-C-0228

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 5.5-5.75 Right Bank While Looking Downstream										
SCC1-16	Shoreline	Shoreline Assessment	•	•	•	•		42.26835	-85.05670	Y / N
EPA-C-0192	Shoreline	SCAT T2 8/27/2010						42.26798	-85.05488	Y / N
EPA-C-0193	Shoreline	SCAT T2 8/27/2010	Minimize Entry. Sheen could possibly be from oiled vegetation, the sheen is staying close to the shore because of the booms and pom poms. zone B encompasses zone C. photo 0003 is of oiled emergent vegetation.					42.26835	-85.05554	Y / N
EPA-C-0194	Shoreline	SCAT T2 8/27/2010	Minimize Entry. fresh pooled oil and some tar along shoreline. oil should vaccuumed out and absorbed. causing sheen. Area is located within zon B, this small area just had different characteristics and was made a zone itself. photo 0005 is of pooled oil.					42.26842	-85.05577	Y / N
EPA-C-0195	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.26852	-85.05647	Y / N
EPA-C-0196	Shoreline	SCAT T2 8/27/2010	Rocky riprap was at the eastern most front of the zone. riprap could easily be low pressure washed. some oily debris was also present on east side boom. the rest of the zone was emergent wetlands that had coated and stained vegetation. lots of spots of floating fresh oil. epa concerned that oiled veg will produce sheen, dnre staff feels the wetland should be left alone and work to retrieve oil in					42.26855	-85.05685	Y / N
EPA-C-0197	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.2695	-85.05788	Y / N
EPA-C-0198	Shoreline	SCAT T2 8/27/2010	Remove sod Replace. Small pockets of pooled oil along shoreline in front of residential houses needs o be absorbed. whole entire shoreline in residential area needs to be cleaned better. tar and surface residue still present on lawns. citizen contacted team and expressed concerns about lack of clean up along shoreline on his property. photo 0008 is of floating oil in front of residence. photo 0009 is of oiled grass in front of residence.					42.26982	-85.0585	MZ 9/23/10 Y / N
EPA-C-0199	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.26987	-85.05905	Y / N

EPA-C-0200 is referenced in next segment, appears to be in this segment on map, will be investigated as in segment 6.0

EPA-C-0268 SCAT T2 (8/15) surface residue and covered shorline with a stained wetland pond, refer to Kalamazoo Enbridge Oil Spill CleanUp ethods 42.269 -85.057 Y / N

EPA-C-0390 SCAT T2 (8/28) Sheen observed on the water close to shoreline, emergent vegatation that is coated from 18" above water surface heen could possibly be from oiled vegetation, the sheen is stained close to shore due to booms and pom poms, Zone B encompasses Zone C a ell, sheen was present prior to agitation by field team, recommend placing pads and new boom in area, booms in entire segment need to be pu nd replaced 42.26843 -85.0555 Y / N

EPA-C-0391 SCAT T2 (8/28) Fresh pooled oil and some tar along shoreline, oil should be vacuumed out and absorbed, causing sheen, area is oated within Zone B this small area just has different characteristics and was made a Zone to itself 42.26841 -85.0577 Y / N

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 5.5-5.75 Right Bank While Looking Downstream (Continued)										
76)	EPA-C-0393 SCAT T2 (8/28) Rocky Rip Rap was at the eastern most front of this Zone, rip rap could easily be low pressures wash, some oily debris was also present on east side of boom, the rest of the zone was emergent wetlands that had coated and stained vegetation, recommendation to low pressure wash the rip rap in zone, removes oily debris 42.26854 -85.05684 Y / N									
X	EPA-C-0394 SCAT T2 (8/28) Reference point only...No Recommendation ✓									
2198)	EPA-C-0395 SCAT T2 (8/28) Small pockets of pooled oil along shoreline in front of residential shorlines, need to be absorbed. The entire shoreline in residential shoreline needs to be remediated better. Tar and surface residue is still present on lawns. Citizen contacted team and expressed concern about lack of cleanup on shoreline on property. 42.26981 -85.05849 Y / N									

MIKE ZAMBETIS (ENBRIDGE) James Saller, MDNRE
9/17/10

COMMENTS: SEE SCAT REASSESMENT OPERATION & MAINTENANCE FORM FOR RIGHT BANK (POINT 5.75B) AT EPA-C-0198 (N 42.26982, W 85.0585)

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 5.50 to MP 5.75 Segment Length: 0.25 mile

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

   Signature (DAVE HODEK) 9/17/10 (date) Enbridge

   Signature Eduardo Rivira 9/17/10 (date) EPA

4. **SCAT Reassessment**

   Signature 9/17/10 (date) Enbridge

   Signature ROSS DELROSARIO 9/17/10 (date) EPA

   Signature James Sallee 9-17-10 (date) MDNRE

5. **EPA**

   Signature Christine Wagner 9/24/10 (date) EPA Division Supervisor

This area is being signed off on shoreline only. This is an area where aeration occurred and because of this heavy oil is still present in the area. Needs DAILY O&M including active oil removal.

Appendix E
Photographs

Field Photo Log - Segment 5.75



Photo – 0425 – Facing north on right descending bank near EPA-C-0193



Photo – 0426 – Facing northwest on right descending bank near EPA-C-0194

Field Photo Log – Segment 5.75



Photo 0427 – Facing northwest on right descending bank near EPA-C-0195.



Photo 0428 – Facing west on right descending bank near EPA-C-0268.

Field Photo Log – Segment 5.75



Photo 0429 – Facing north on right descending bank.



Photo 0430 – Facing north on right descending bank near EPA-C-0197.

Field Photo Log – Segment 5.75



Photo 0431 – Facing northwest on right descending bank near EPA-C-0198.



Photo 0432 – Facing northwest on right descending bank near EPA-C-0199.

Field Photo Log – Segment 5.75



Photo 0438 – Facing southeast on left descending bank.



Photo 0439 – Facing southeast on left descending bank near EPA-C-0205.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 6.0 – MP 5.75 to 6.0

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 6.0 had light to moderate levels of oil staining on the left descending bank. The left descending shoreline/overbank areas contained areas of oil stained vegetation, debris, rip rap, pooled oil, overhanging vegetation, and rocks requiring removal/cleaning. The shoreline of segment MP 6.0 had no oil to light oil staining on the right descending bank from Ceresco Dam downstream through the segment. The right descending overbank areas contained oiled debris, oiled rocks, and floating oil inside the oil containment booms, and a heavily oiled small pond on private property.

Actions

The shoreline clean-up activities within Segment 6.0 consisted of the following:

- Mechanical aquatic vegetation removal;
- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- High pressure wash and absorption methods on larger rocks and boulders with downstream snare and boom capture;
- Vegetation removal from the waterline leaving roots intact and woody plants greater than 2" in diameter;
- Cut, bag, and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Manual removal of oiled debris;
- Manual removal (scraping) on larger rocks and boulders;
- Pooled oil removal;
- Turf removal.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled rock/cobble along the left descending bank upstream of Ceresco Dam;
- Oiled rock/cobble and oiled herbaceous and woody vegetation along the left descending bank in SCAT assessment zone A;
- Oiled rock/cobble along the left descending bank immediately downstream of Ceresco Dam;
- A section along the left descending bank downstream of Ceresco Dam contained oiled woody and herbaceous vegetation as well as oiled rock/cobble;

- Oiled herbaceous vegetation along the right descending bank upstream of Ceresco Dam;
- Oiled rock/cobble along the right descending bank in SCAT assessment zone B;
- Oiled herbaceous vegetation and a pond with sheen along the right descending bank immediately upstream of Ceresco Dam;
- A pond with sheen and oiled woody vegetation along the right descending bank downstream of Ceresco Dam.

Segment 6.0 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill Clean-up Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials)

    - Right Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials)

- **Appendix B: Step 2 Clean-up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank – Reassessment Conclusion Table
    - Right Descending Bank – Reassessment Conclusion Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

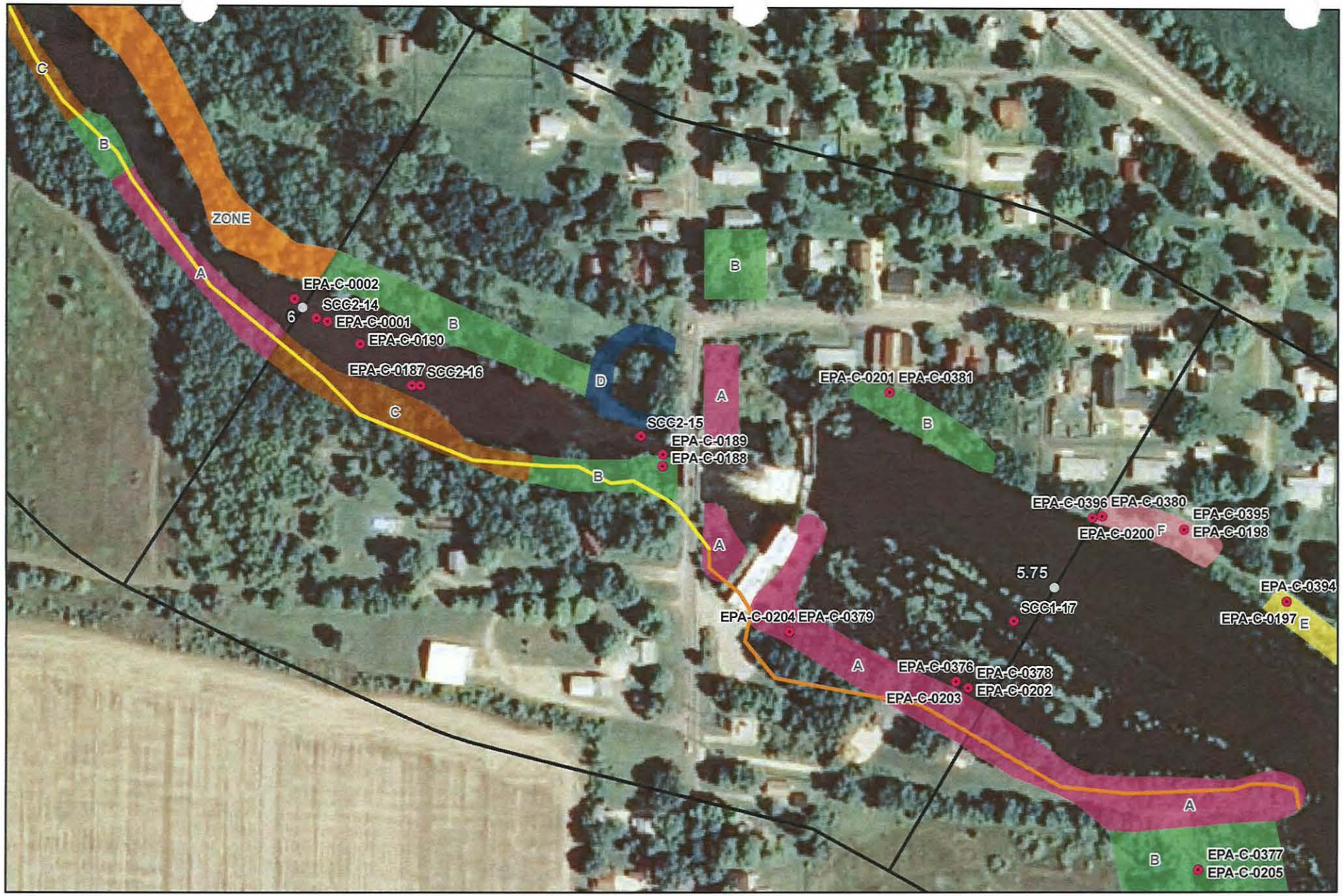
Enbridge Pipeline Release Incident - Kal. .azoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 5.75-6.00 Left Bank While Looking Downstream									
SCC2-16	Shoreline	Shoreline Assessment 8/6/2010	●		●	●	High volume flush. Oiling is 1-2 meters on the bank.		
SCC1-17	Shoreline	Shoreline Assessment Unknown Date	●	●	?	●	Potential need for wetland veg. removal		
SCC1-18	Shoreline	Shoreline Assessment Unknown Date	●	●	●	●	Possible need for mechanical removal.		
EPA-C-0187	Main Channel	SCAT-T2 8/17/2010					Suggest further remediation.		
EPA-C-0188	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Reccomendation Methods						

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 5.75-6 Left Bank While Looking Downstream									
SCC1-17	Shoreline	Shoreline Assessment	•	•	?	•	Potential need for wetland veg. removal	42.26940	-85.05952
SCC2-16	Shoreline	Shoreline Assessment	•		•	•	High volume flush. Oiling is 1-2 meters on the bank.	42.2704	85.0631
EPA-C-0202	Shoreline	SCAT T2 8/27/2010	Remove oiled Vegetation Leaving roots					42.2691	-85.0598
EPA-C-0204	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.26934	-85.06088





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B B/C C D E F G H NO OIL ZONE

Division C: Mile Marker 5.75-6
Left Bank While Looking Downstream

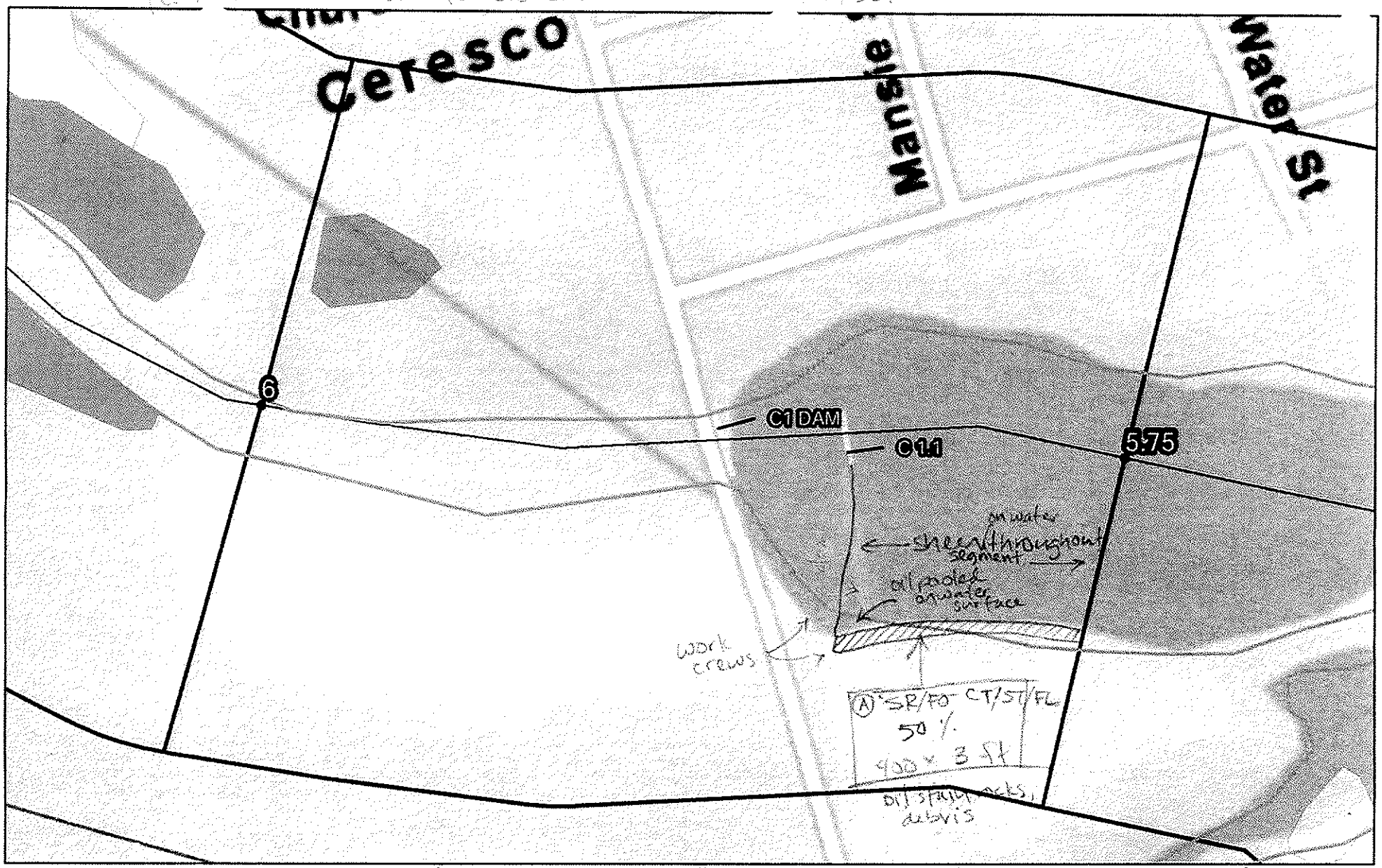
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Shoreline
Wetlands
Emergent
Forested
Scrub-Shrub
River_Quarter4th

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 48

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGA[illegible] FEET

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 5.75-6.00 Right Bank While Looking Downstream									
SCC2-14	Shoreline	Shoreline Assessment 8/6/2010			●	●			
SCC2-15	Shoreline	Shoreline Assessment 8/6/2010		●	●	●	Private property. Small pond is heavily oiled.		
EPA-C-0001	Unknown	SCAT-T1 8/15/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Reccomendation Methods						
EPA-C-0190	Unknown	SCAT-T2 8/18/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Reccomendation Methods						
EPA-C-0189	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Reccomendation Methods						

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 5.75-6 Right Bank While Looking Downstream									
SCC2-14	Shoreline	Shoreline Assessment			•	•			
SCC2-15	Shoreline	Shoreline Assessment		•	•	•	Private property. Small pond is heavily oiled.		
EPA-C-0200	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.26987	-85.05899
EPA-C-0201	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.270422	-85.06028





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

Division C: Mile Marker 5.75-6
Right Bank While Looking Downstream

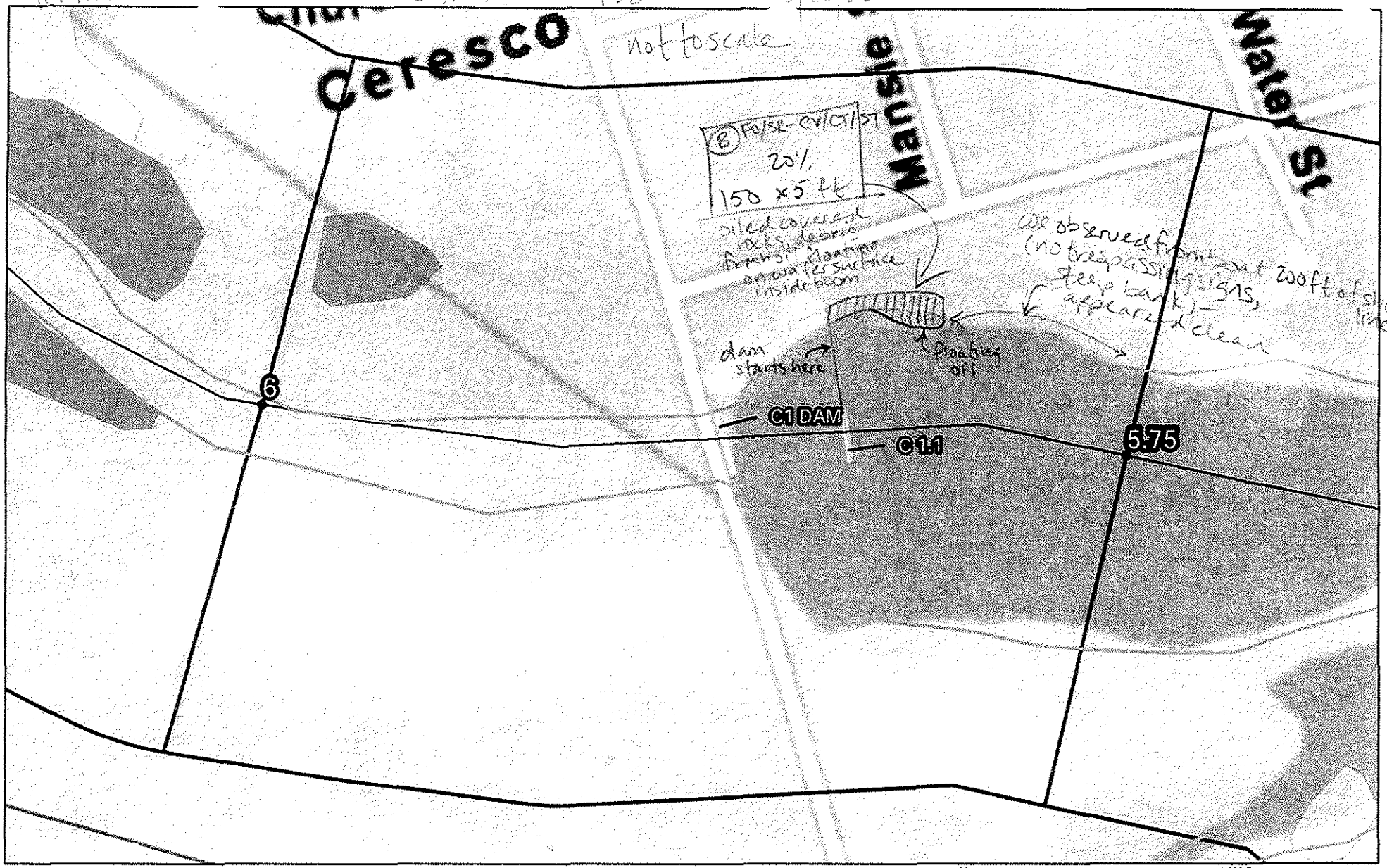
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth, Down to Business
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/15/10 **Time: AM / (PM)**

Operations Division: C **Segment ID: From** 5.75 **Start MP to End MP** 6.0 **Segment Length: 0.25 mile**

Bank: (LDB) / (RDB) ☐ **Island** **Overbank:** (LOB)/(ROB)

Weather: (Sun)/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: ELMER GUY TOWNER

Division Supervisor(Contractor): JOSHUA JEFFREYS

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean up Complete

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean up Complete

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean up Complete

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Clean up complete

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/15/10 **Time: AM / PM**

Operations Division: 1 **Segment ID: From** 5.75 **Start MP to End MP** 6.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

Recommendations are flushing, Pooled oil Removal, vegetation Removal High pressure cold water flushing of Larger Rocks & Boulders

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Vegetation has Been cut, Larger Rocks & Boulders have been Scraped, Flushed, High pressure flushed and all oiled woody debris matting has been Removed. All SCAT Requirements have been performed

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

[redacted]

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 5.75-6.00 Left Bank While Looking Downstream										
SCC2-16	Shoreline	Shoreline Assessment 8/6/2010	●		●	●	High volume flush. Oiling is 1-2 meters on the bank.			(Y) N
SCC1-17	Shoreline	Shoreline Assessment Unknown Date	●	●	?	●	Potential need for wetland veg. removal			(Y) / N
SCC1-18	Shoreline	Shoreline Assessment Unknown Date	●	●	●	●	Possible need for mechanical removal.			(Y) / N
EPA-C-0187	Main Channel	SCAT-T2 8/17/2010					Suggest further remediation.			(Y) / N
EPA-C-0188	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N

Printed Team Member Names: James Sallee, MONRE, MIKE ZAMBETIS (ENBRIDGE), ROSS DELROSARIO, USEPA

Date: 9-17-10

Comments: SCC1-17 - ERRONEOUSLY SHOWN IN RIVER CENTER. POINT NOT FOUND BUT WETLAND VEGETATION ADEQUATELY REMOVED THROUGHOUT THE ENTIN SEGMENT

EPA-C-0187 ADD ABSORBENT BOOM ALONG SHORELINE IN O&M PHASE.

SCC1-18 - SPECIFIC LOCATION UNCERTAIN, BUT GENERAL SCAT RECOMMENDATIONS HAVE BEEN COMPLETED IN THE SEGMENT

OLM

EPA-C-0202 SCAT T2 (8/27) Removed oiled vegetation, leaving roots 42.2690 -85.05979 (Y) / N

EPA-C-0378 SCAT T2 (8/27) Immediately upstream of dam on left descending bank sie, oil pooled on water surface and oil stained rocks and debris along shoreline, 1-3" above waterline, sheen on water through area 42.2692 -85.05979

EPA-C-0203 SCAT T2 (8/27) No comment, please refer to the Kalamazoo Enbridge Oil Cleanup Methods 42.26912 -85.05986 (Y) / N

EPA-C-0376 Crews removed low hanging limbs, oil stained rocks and rip rap remain 42.26912 -85.05986 (Y) / N

EPA-C-0204 SCAT T2 (8/27) No comment, refer to Kalamazoo Enbridge Oil Cleanup Methods 42.26934 -85.06087 (Y) / N

EPA-C-0379 NA Referenced

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 5.75-6 Left Bank While Looking Downstream										
SCC1-17	Shoreline	Shoreline Assessment	•	•	?	•	Potential need for wetland veg. removal	42.26940	-85.05952	(Y) N
SCC2-16	Shoreline	Shoreline Assessment	•		•	•	High volume flush. Oiling is 1-2 meters on the bank.	42.2704	85.0631	(Y) / N
EPA-C-0202	Shoreline	SCAT T2 8/27/2010	Remove oiled Vegetation Leaving roots					42.2691	-85.0598	(Y) N
EPA-C-0204	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.26934	-85.06088	(Y) / N
EPA-C-0203	Shoreline/ Overbank	SCAT T2 8/27/2010	Refer to Kalamazoo River/Embridge Spill Cleanup Recommendation Methods					42.26913	-85.05987	(Y) / N

Printed Team Members Name: James Saller, MDNRE, Mike Zambetis (Enbridge), Ross Del Rosario, USEPA
Date: 9-17-10
Comments:

*Note: Re-SCAT team found the "200" series I.D. points in the field, due to the similar mapped locations and recommendations to those of the "300" series I.D. points, the Re-SCAT team operated with the idea that the 2 point series were a duplication of recommendations.

* Continue cleanup efforts at C-0204 through O&M phase.

EPA-C-0378 NA Immediately upstream of dam, oil pooled on water surface oil stained rocks and debris along shoreline, 1-3" above water line, sheen on water through area, remove pooled oil and debris 42.26909 -85.05979
EPA-C-0376 NA Crews removed overhanging limbs, oil stained rocks and rip rap remain, recommend power wash on rip rap 42.26912 -85.05986 (Y) N
EPA-C-0379 NA Area where 20 year old snapping turtle was found, no comments no recommendations (notified wildlife hotline)

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 5.75-6 Right Bank While Looking Downstream										
SCC2-14	Shoreline	Shoreline Assessment			•	•				(Y) / N
SCC2-15	Shoreline	Shoreline Assessment		•	•	•	Private property. Small pond is heavily oiled.			(Y) / N
EPA-C-0200	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.26987	-85.05899	(Y) / N
EPA-C-0201	Shoreline	SCAT T2 8/27/2010	Refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods					42.270422	-85.06028	(Y) / N

Printed Team Members Name: James Saller, Mike Zambetis (Enbridge), Ross Del Rosario, USEPA
Date: 9-17
Comments:

1.) Oiled debris still inside boom @ EPA-C-0381
2.) Additional Debris needs to be addressed in O&M Phase.

EPA-C-0381 SCAT T2 (8/28) Area is currently being worked on by cleanup crew, oiled rocks and floating oil inside of boom, oiled debris should be removed. 42.27042 -85.06028 (Y) / N
EPA-C-0380 SCAT T2 (8/28) No comments reference point
EPA-C-0396 SCAT T2 (8/28) NO comments reference point

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 5.75-6.00 Right Bank While Looking Downstream										
✓ SCC2-14	Shoreline	Shoreline Assessment 8/6/2010			•	•				(Y) N
✓ SCC2-15	Shoreline	Shoreline Assessment 8/6/2010		•	•	•	Private property. Small pond is heavily oiled.			(Y) N
✓ EPA-C-0001	Unknown	SCAT-T1 8/15/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) N
EPA-C-0190	Unknown	SCAT-T2 8/18/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) N
EPA-C-0189	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) N

Printed Team Member Names: James Saller, MDNRE
Date: 9-17-10
Comments: ROSS DEL ROSARIO, USEPA
MIKE ZAMBETIS (ENBRIDGE)

Refer to OOM sheets for this segments

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 5.75 **to MP** 6.0 **Segment Length: 0.25 mile**

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature (DAVE HODEK) 9/17/10 (date) Enbridge

Signature Eduardo Rivera 9/17/10 (date) EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBOS 9/17/10 (date) Enbridge

Signature ROSS DEL ROSARIO 9/17/10 (date) EPA

Signature James Soller 9/17/10 (date) MDNRE

5. **EPA**

Signature 9/23/10 (date) EPA Division Supervisor

1. Boom maintenance and skimming will continue at Ceresco Dam.
2. Submerged oil should be evaluated upstream of dam.

Appendix E
Photographs

Field Photo Log – Segment 6.0



Photo 0433 – Looking northeast toward the right descending bank.

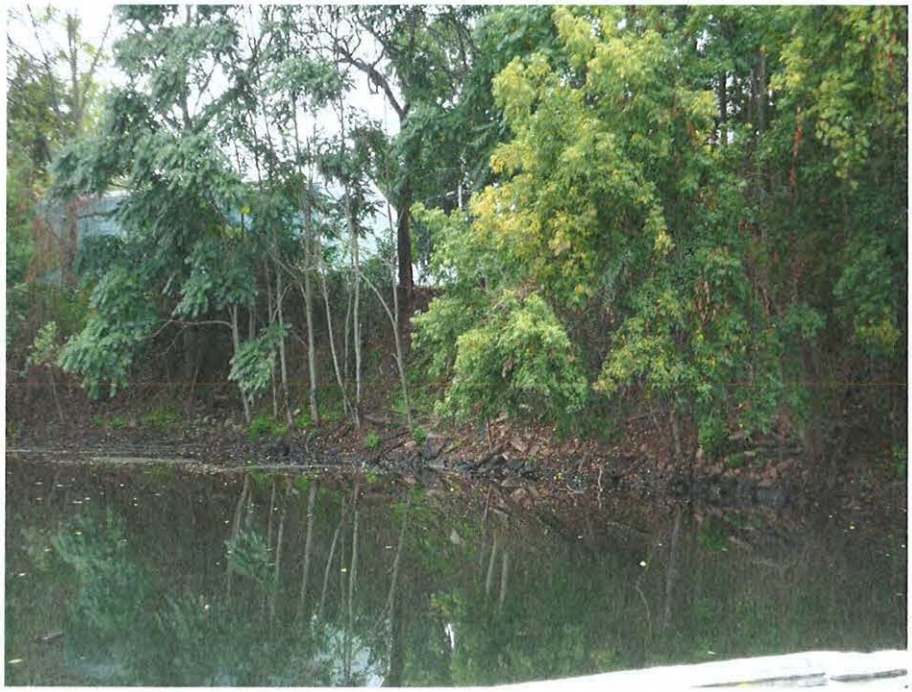


Photo 0434 – Looking north toward the right descending bank near EPA-C-0201.



Photo 0435 – Looking southwest toward the left descending bank near EPA-C-0204.



Photo 0436 – Looking west toward the left descending bank near EPA-C-0204.



Photo 0437 – Looking southeast toward the left descending bank.

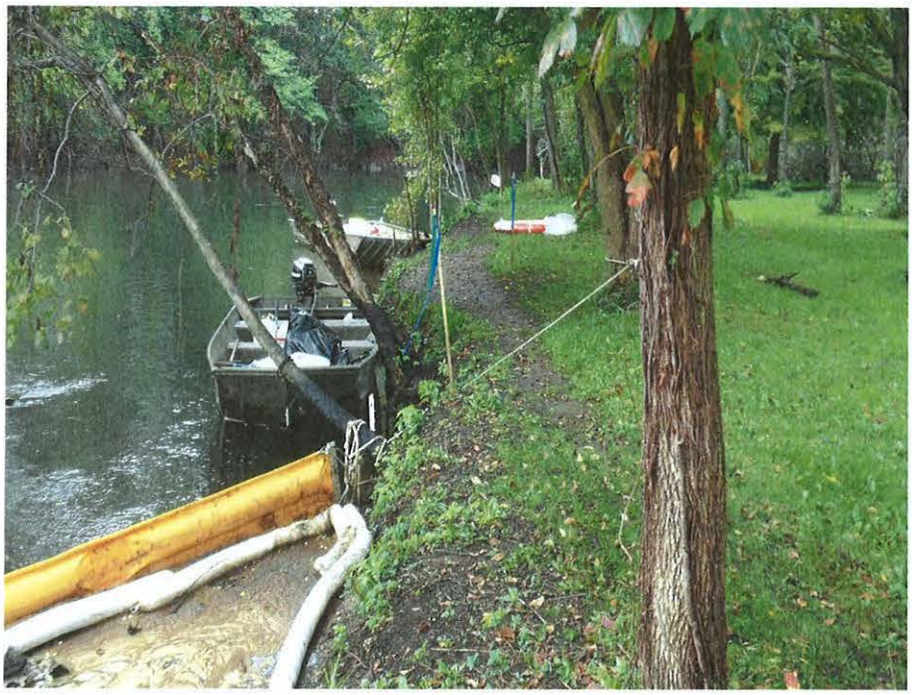


Photo 0503 – Looking southeast toward the right descending bank near EPA-C-0001.



Photo 0504 – Looking southeast toward the right descending bank.



Photo 0505 – Looking east toward the right descending bank near EPA-C-0189.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 6.25 – MP 6.00 to 6.25

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 6.25 had light oiling, oiled rip-rap, oiled debris and oiled vegetation on the left descending bank. There were no islands present in this segment. Light oiling, oiled debris and oiled vegetation was observed on the right descending bank. The overbank contained no areas requiring clean-up.

Actions

The shoreline clean-up activities within Segment 6.25 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads;
- Removal of oiled debris;
- Removal of overhanging vegetation;
- High pressure flushing of man-made structures and/or rocks.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody vegetation along left descending bank;
- Oiled rocks and cobble on the left descending bank near MP 6.25 and the midpoint of the segment;
- Oiled debris in the river along the left and right descending banks;

- Oiled herbaceous vegetation on the right descending bank near the midpoint of the section.

Segment 6.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

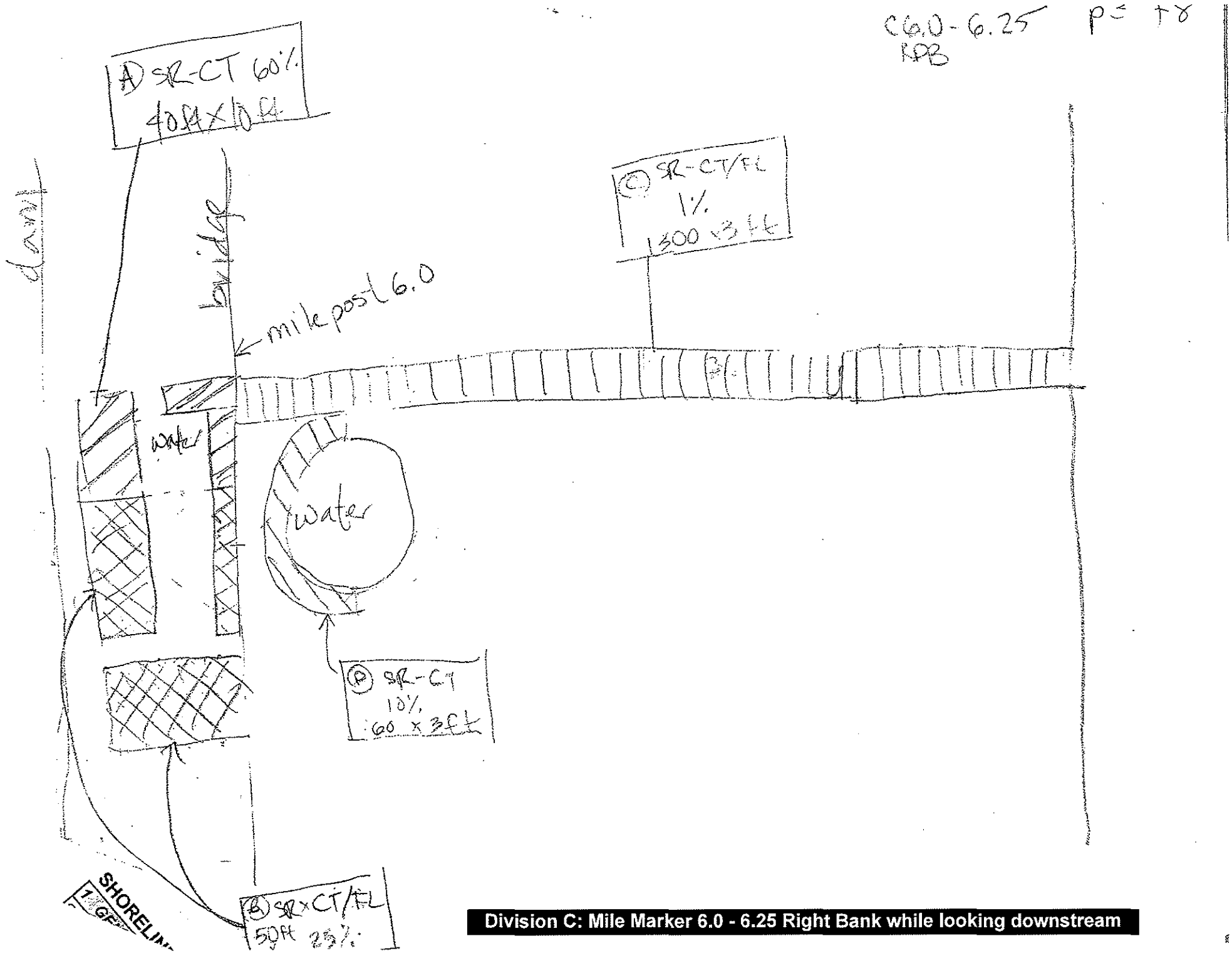
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 6.00-6.25 Left Bank While Looking Downstream									
* (Zone A)	Shoreline	SCAT-T1 8/20/10	•				Contains dam, bridge, & riprap, which are all coated or stained from 3-6 ft. wide and 200 ft. along shoreline. Low pressure wash wish boom containment suggested. Power wash on bridge and dam. All overhanging vegetation has been cut.		
* (Zone B)	Shoreline	SCAT-T1 8/20/10	•				Addressed by cleanup crew. Most vegetation is cut. There's still surface residue and staining along the shoreline. All overhanging vegetation has been cut.		
* (Zone C)	Shoreline	SCAT-T1 8/20/10	•			•	Zone C has no vegetation cut. There is still coating and heavy staining on shoreline. Shoreline contains a lot of rocks and boulders that could be powerwashed. Shoreline debris is coated and could be collected and removed.		

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 6.00-6.25 Right Bank While Looking Downstream									
SCC2-13	Shoreline	Shoreline Assessment 8/6/2010			•	•			
EPA-C-0002	Unknown	SCAT-T1 8/15/2010	Refer to Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods						
* (Zone A)	Shoreline	SCAT-T2 8/20/10	•		•		Pool west of 15 mile Rd has sheen. Sheens in boat/staging areas on shoreline. Sparse areas of coated overhanging vegetation. Crews still working in area between dam and 15 mile.		
* (Zone B)	Overbank	SCAT-T2 8/20/10	•		•		See comments above.		
* (Zone C)	Shoreline	SCAT-T2 8/20/10	•		•		See comments above.		
* (Zone D)	Overbank	SCAT-T2 8/20/10	•		•		See comments above.		



Division C: Mile Marker 6.0 - 6.25 Right Bank while looking downstream

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/3/10 **Time: AM / PM** 1000 HRS

Operations Division: C **Segment ID: From** 6 **Start MP to End MP** 6.25 (6.25) **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank:** LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

ALL REQUIREMENTS WERE MET/COMPLETED.
AREAS GREEN FLAGGED.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each Item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

ALL REQUIREMENTS MET/COMPLETED.
AREAS GREEN FLAGGED.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090510 **Time: AM / PM**

Operations Division: C **Segment ID: From** 6 **Start MP to End MP** 6.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Reviewed – Description of Clean Up Required

Reviewed 7 areas identified by SCAT ~~[redacted]~~
Flushing + veg removal were needed.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Work completed

Punchlist Items Identified

☑ **Punchlist Items Complete** (add check on punchlist item when completed)

Rocky shoreline needed flushing

Appendix C
Step 4 – SCAT Reassessment Documentation

TEAM 5 9/3/10

SCAT REASSESSMENT CONCLUSIONS

ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 6-6.25 Left Bank While Looking Downstream										
									Contains dam, bridge, & riprap, which are all coated or stained from 3-6 ft. wide and 200 ft.	
* (Zone A)			Shoreline	SCAT-T1 8/20/10	•				along shoreline. Low pressure wash wish boom containment suggested. Power wash on bridge and dam. All overhanging vegetation has been cut.	Y / N
* (Zone B)			Shoreline	SCAT-T1 8/20/10	•				Addressed by cleanup crew. Most vegetation is cut. There's still surface residue and staining along the shoreline. All overhanging vegetation has been cut.	Y / N
* (Zone C)			Shoreline	SCAT-T1 8/20/10	•			•	Zone C has no vegetation cut. There is still coating and	(Y) / N

OK WJB 9/6/10
OK DLS 9/6/10
O.K. MAZ 9/16/10

COMMENTS

- ZONE C - OIL COATED ROCKS REMAIN REQUIRING ATTENTION BY SCRAPING OR POWER WASHING.

① - WP002 = DOWNSTREAM END OF COATED ROCK AREA; WP004 = UPSTREAM END OF ROCK SCRAPING AREA
→ N 42° 16.320' W085° 03.933' - Picture 1
→ N 42° 16.254' W085° 03.869' / This have been cleaned

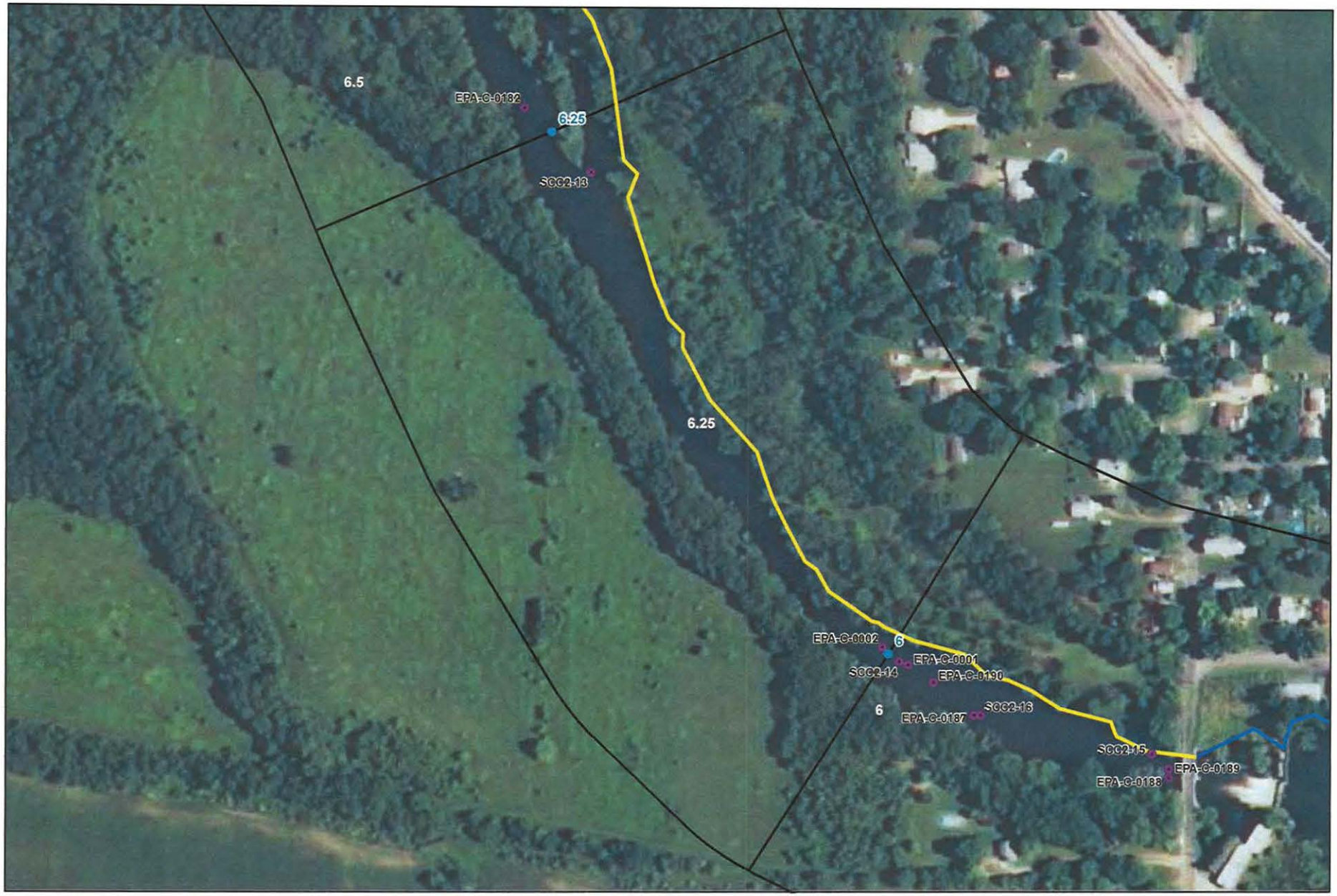
② WP-003 → 12 x 3' AREA OF OILED SHORELINE DEBRIS - RAKE (REMOVE OILED DEBRIS)
→ N 42° 16.310' W085° 03.920' - Picture 2

~~3.~~ OILED DEBRIS REMAINS OUTSIDE OF RECOMMENDED CLEANUP ZONE, +/- 6' FROM WATERLINE, SHOULD BE REMOVED BY O&M STAFF. — Most of the debris has been cleaned. However, some of the seal is still oily and has some sheen - no clean-up required

SCAT REASSESSMENT CONCLUSIONS

ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 6-6.25 Right Bank While Looking Downstream										
SCC2-13			Shoreline	Shoreline Assessment 8/6/2010			•	•		(Y) / N
EPA-C-0002			Unknown	SCAT-T1 8/15/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods					(Y) / N
~~* (Zone A)~~			~~Shoreline~~	SCAT-T2 ~~8/20/10~~	•		•		Pool west of 15 mile Rd has sheen. Sheens in boat/staging areas on shoreline. Sparse areas of coated ~~overhanging~~ vegetation. Crews still working in area between dam and 15 mile.	~~Y / N~~
~~* (Zone B)~~			~~Overbank~~	SCAT-T2 ~~8/20/10~~	•		•		See comments above.	Y / N
* (Zone C)			Shoreline	SCAT-T2 8/20/10	•		•		See comments above.	(Y) N
~~* (Zone D)~~			~~Overbank~~	SCAT-T2 ~~8/20/10~~	•		•		~~See comments~~ above.	~~Y / N~~

9/3/10 Dana Strouse Team 5
9/3/10 Bill Bates
9/3/10 Mike Zambetis





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 6.0 - 6.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

7 COMMENTS — Cleanup recommendations — ecological/recreational/cultural/economic issues & constraints — wildlife obs. Seg # ___

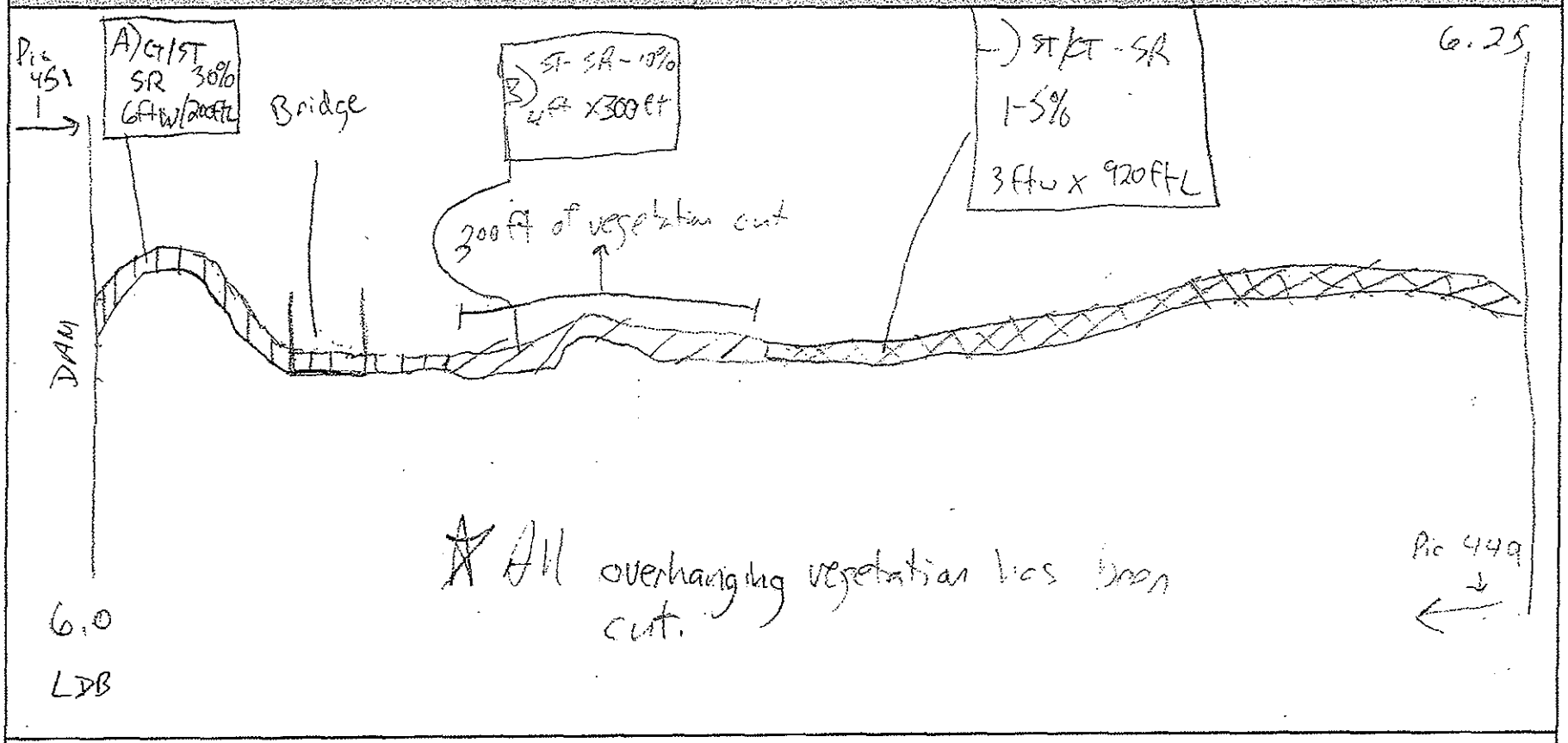
A.) Zone A contains the dam, bridge, and Rip rap which are all coated or stained for about anywhere from 3ft - 6ft wide and 200 ft along shoreline. Low pressure wash w/ boom containment is suggested. Power wash on bridge and dam.

B.) Zone B has been addressed by cleanup crew, most vegetation is cut. There is still surface residue and staining along the shoreline.

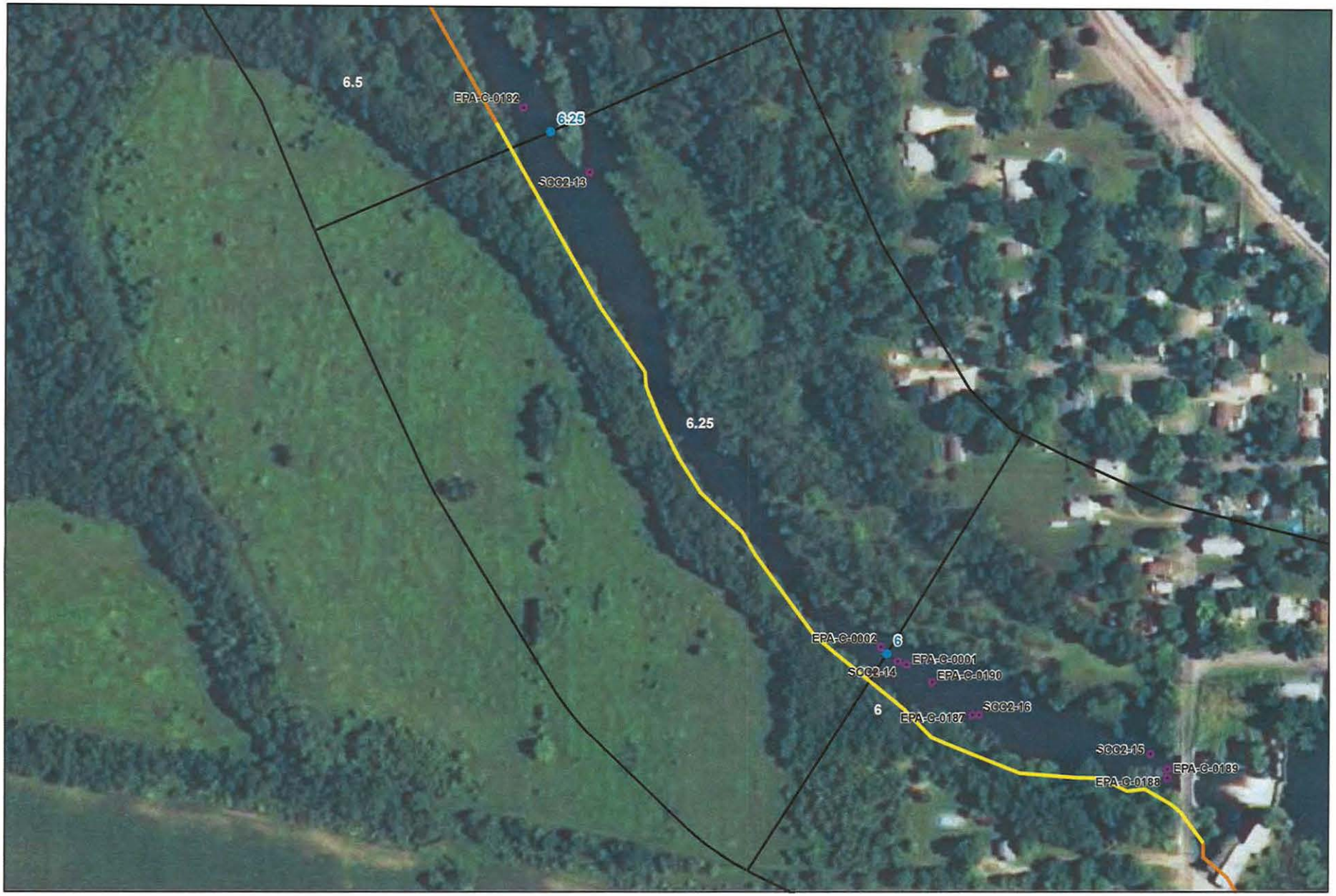
C.) Zone C has no vegetation cut, there is still coating and heavy staining on shoreline. Shoreline contains alot of rocks and boulders that could be powerwashed. Shoreline debris is coated and could be collected and removed.

Note: Nothing in overbank in entire segment, high shoreline.

8 SKETCH



Sketch Y/N Photos Y/N (# _____) Video Y/N — Division C: Mile Marker 6.0 - 6.25 Left Bank while looking downstream — SCAT form





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 6.0 - 6.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

29 Aug '10

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 6.00 **to MP** 6.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAUX	8/29/10 (date)	Enbridge
Signature M. J. INALIPINSKI	29 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBRANO	9/6/10 (date)	Enbridge
Signature WILLIAM BATES	9/6/10 (date)	EPA
Signature Dana Strouse	9/6/10 (date)	MDNRE

5. **EPA**

Signature	9/22/10 (date)	EPA Division Supervisor

Include ROB near steps in O+M WEEKLY

Appendix E
Photographs



Photo 0123 – Looking southeast at left descending bank.



Photo 0124 – Looking southeast at left descending bank.



Photo 0125 – Looking south at left descending bank.



Photo 0126 – Looking southeast at left descending bank.



Photo 0127 – Looking south at left descending bank.



Photo 0128 – Looking north at right descending bank, near EPA-C-0002.



Photo 0129 – Looking north at right descending bank, near EPA-C-0002.



Photo 0130– Looking north at right descending bank, near EPA-C-0002.

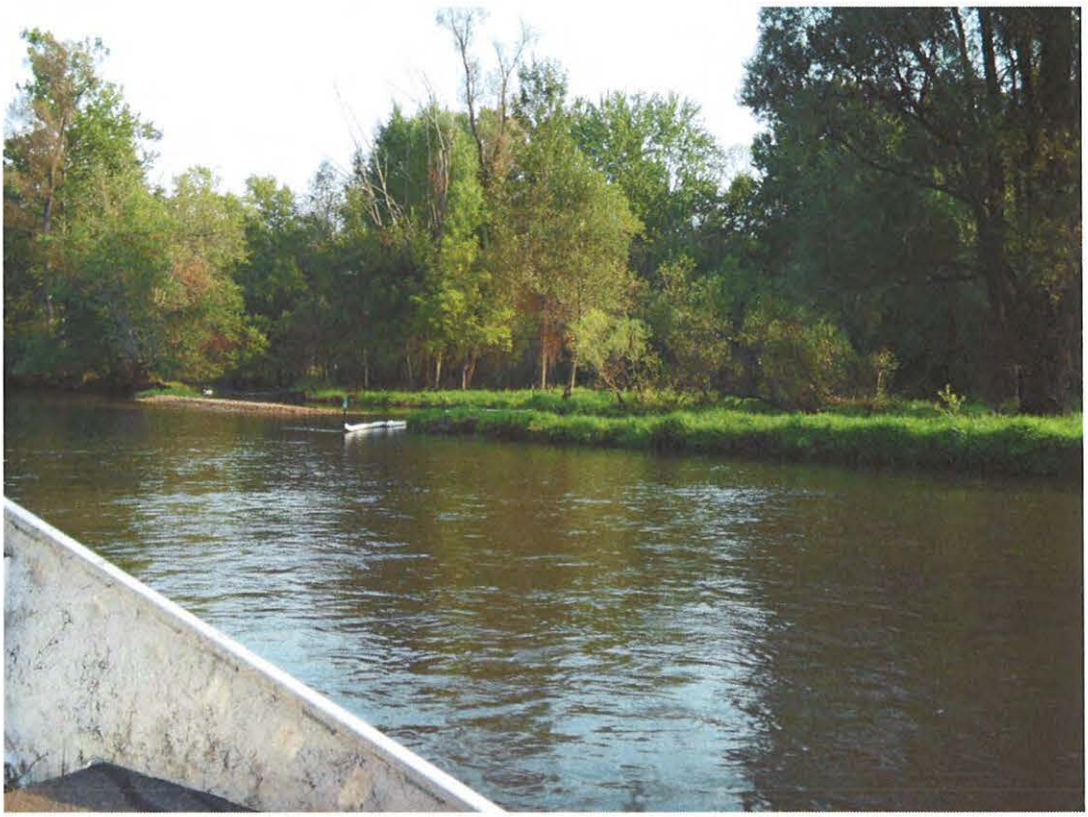


Photo 131 – Looking northwest at island, near SCC2-13.



Photo 0132 – Looking northeast at island, near SCC2-13.



Photo 0133 – Looking east at island, near SCC2-13.



Photo 0134 – Looking northeast at island, near SCC2-13.



Photo 0135 – Looking north at island, near SCC2-13.



Photo 0136 – Looking east at island, near SCC2-13.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 6.50 – MP 6.25 to 6.50

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 6.50 had light and moderate oiling on the left descending bank and light oiling on the right descending bank. The overbank areas contained a small area of oiling on the right overbank. Some oiling of vegetation was present on the island. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 6.50 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- Removal of oiled debris
- Removal of overhanging vegetation
- Soil scraped and removed 1" to 2"

Outcome

Some oil was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled trees and oil coated logs (remaining suspended above river) remain within first 4-500' downstream of MP 6.25 on left and right descending bank
- Oiled soil remains on left descending bank in SCAT zones A, and G
- Oiled soil remaining, with required operation and maintenance activities. Operation and maintenance activities will consist of containment and absorbent booming strategies as required

Segment 6.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

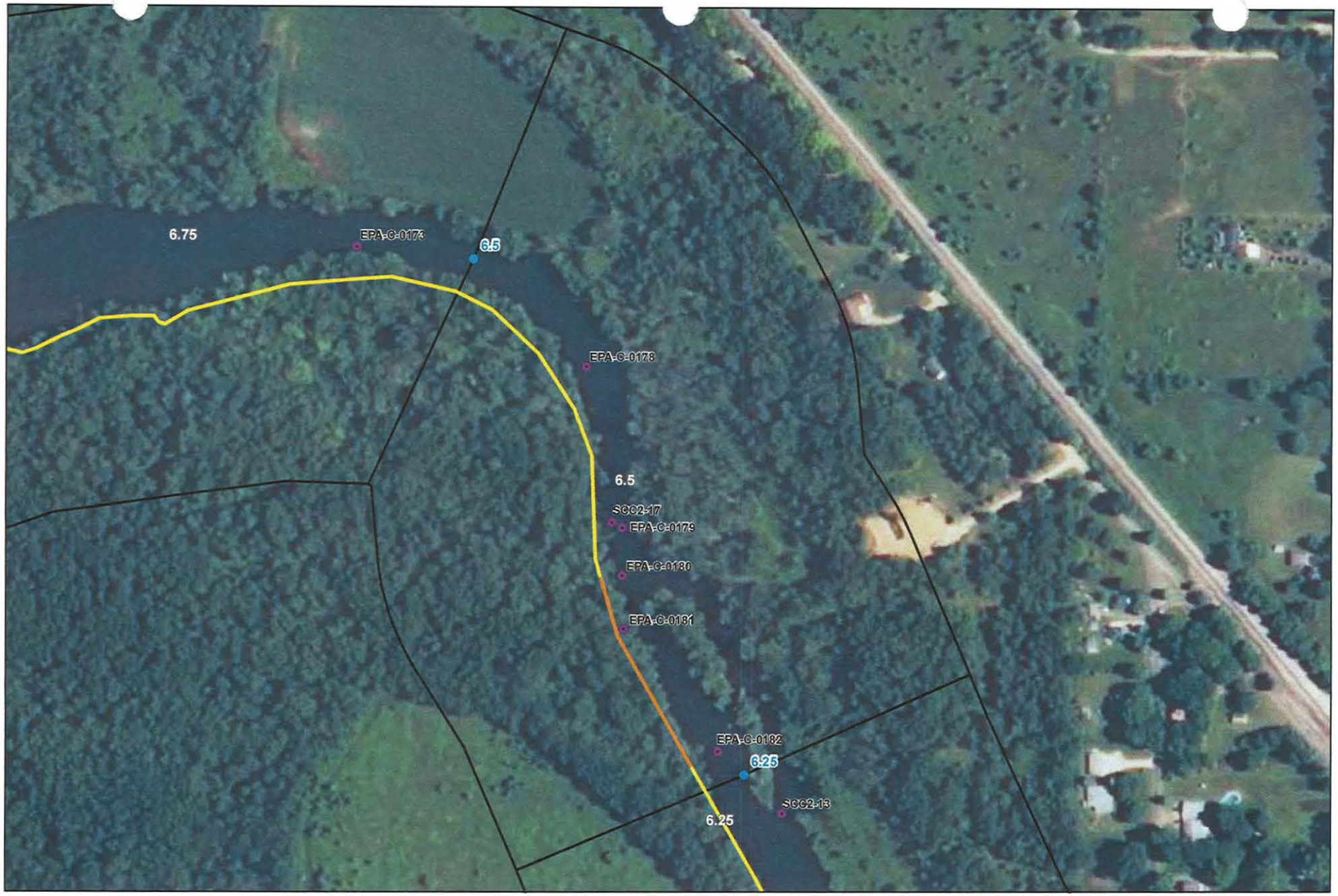
Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

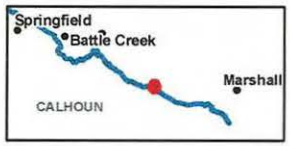
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 6.25-6.50 Left Bank While Looking Downstream									
SCC2-17	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	Log jams with floating oil.		
EPA-C-0182	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods						
EPA-C-0181	Shoreline	SCAT-T2 8/17/2010					Active vegetation cutting and overhanging debris.		
EPA-C-0180	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods						
EPA-C-0179	Unknown	SCAT-T2 8/17/2010			•		Some Trimming. No active remediation		
EPA-C-0178	Main Channel	SCAT-T2 8/17/2010			•		Some trimming. No active remediation.		





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 6.25 - 6.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

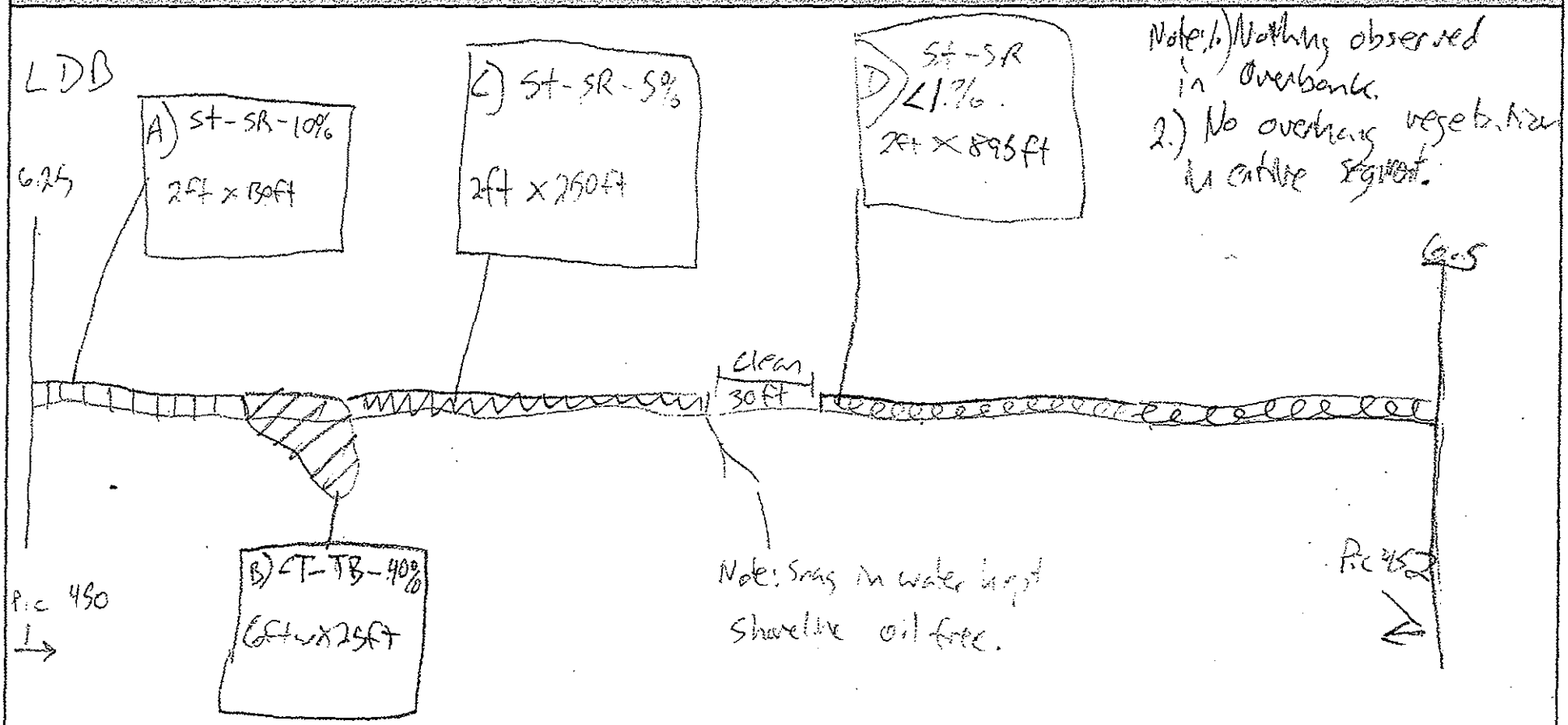
7 COMM...TS | Cleanup recommendations — ecological/reci | onal/cultural/economic issues & constraints — wildlife obs.

A.) Stained shoreline with some rocks and debris. Not likely to re-mobilize, no suggested actions.

B.) Zone B is a log snag, stretching about 6ft out from shore. Log is thicker than 4 in, but it is heavily coated in tar, and when water lifts the tar, it produces sheen. If possible, remove outer bark of log. (tree is dead already)

C, D) Except for a small clean stretch, most shoreline is only stained, which could be left alone. There a lot of rocks, boulders, snags, and dead heads that have tar on them. The tar should be scraped off and discarded. The tar does produce a sheen.

8 SKETCH



Sketch Y/N Photos Y/N (# _____) Video Y/N

Division C: Mile Marker 6.25 - 6.50 LDB Looking Downstream

SCAT form

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 6.25-6.50 Island									
* (Zone A)	Shoreline	SCAT-T1 8/20/10					Stain and some residual on the shoreline. Recommend to scrape it and discard.		
* (Zone B)	Overbank	SCAT-T2 8/20/10					Patch on the interior of the island that has been cleaned by a crew already. Vegetation is cut, but some tar and residue still remains. Can be raked and discarded. Note another island exactly east, assessment of that island performed by Team #2.		

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 6.40-6.45 Island									
* (Zone A)		SCAT-T2 8/20/10				•	Island - crews had removed most of the vegetation and mucky area causing a sheen in the river. Recommend boom placement. Some oiled woody vegetation noted on banks.		

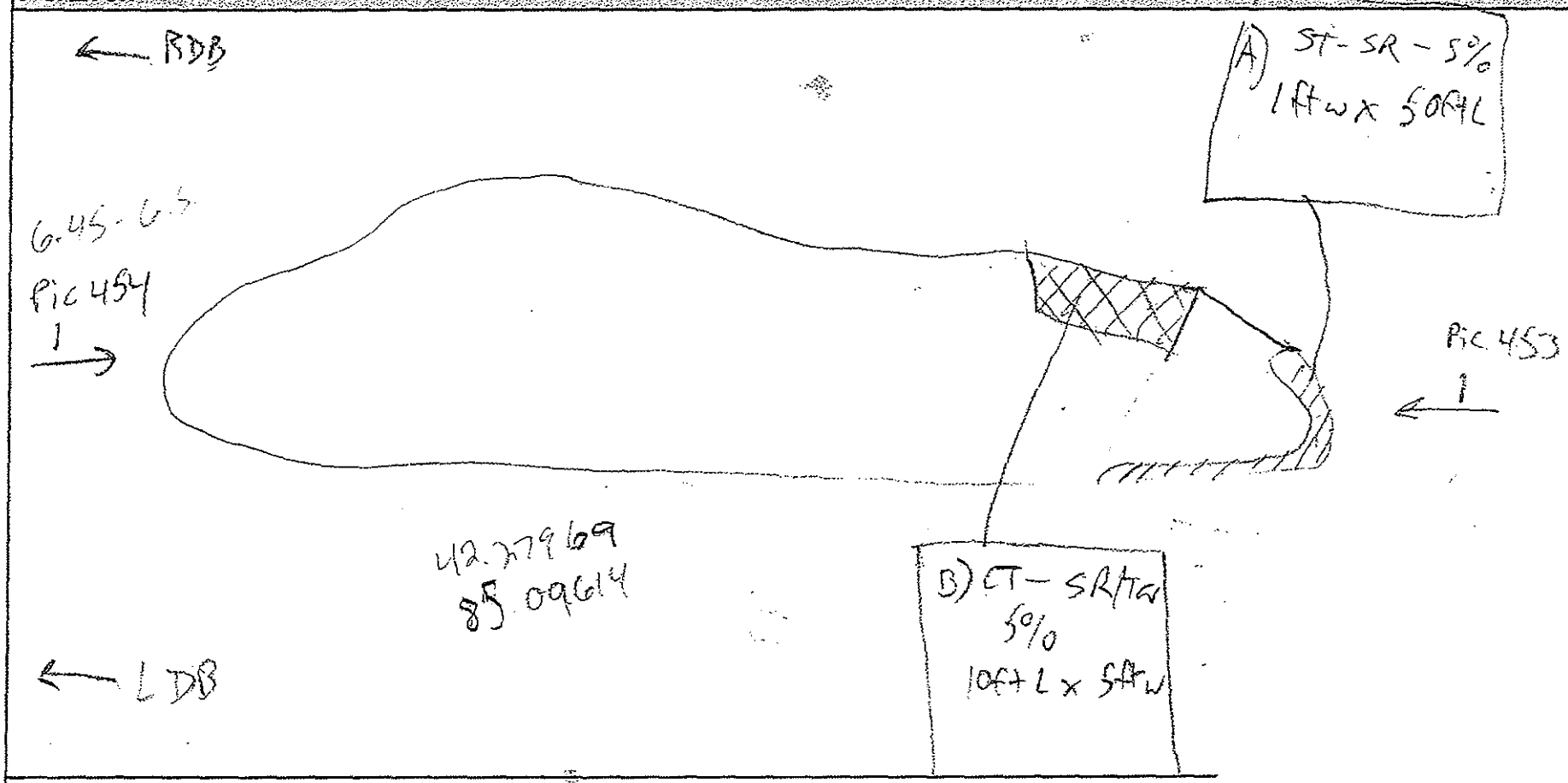
7 COMMENTS | Cleanup recommendations — ecological/rec. | onal/cultural/economic issues & constraints — wildlife obs.

A.) Stain and some residual on the shoreline. Recommend to scrape it and discard.

B.) Patch on the interior of the island that has been cleaned by a crew already. Vegetation is cut, but some tar and residue still remains. Can be raked and discarded.

Note: Another island exactly east, assessment of that island performed by team #2.

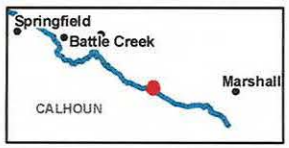
8 SKETCH



Sketch Y/N Photos Y/N (# _____) Video Y/N

Division C: Mile Marker 6.25 - 6.50 Island





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 6.25 - 6.5
Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

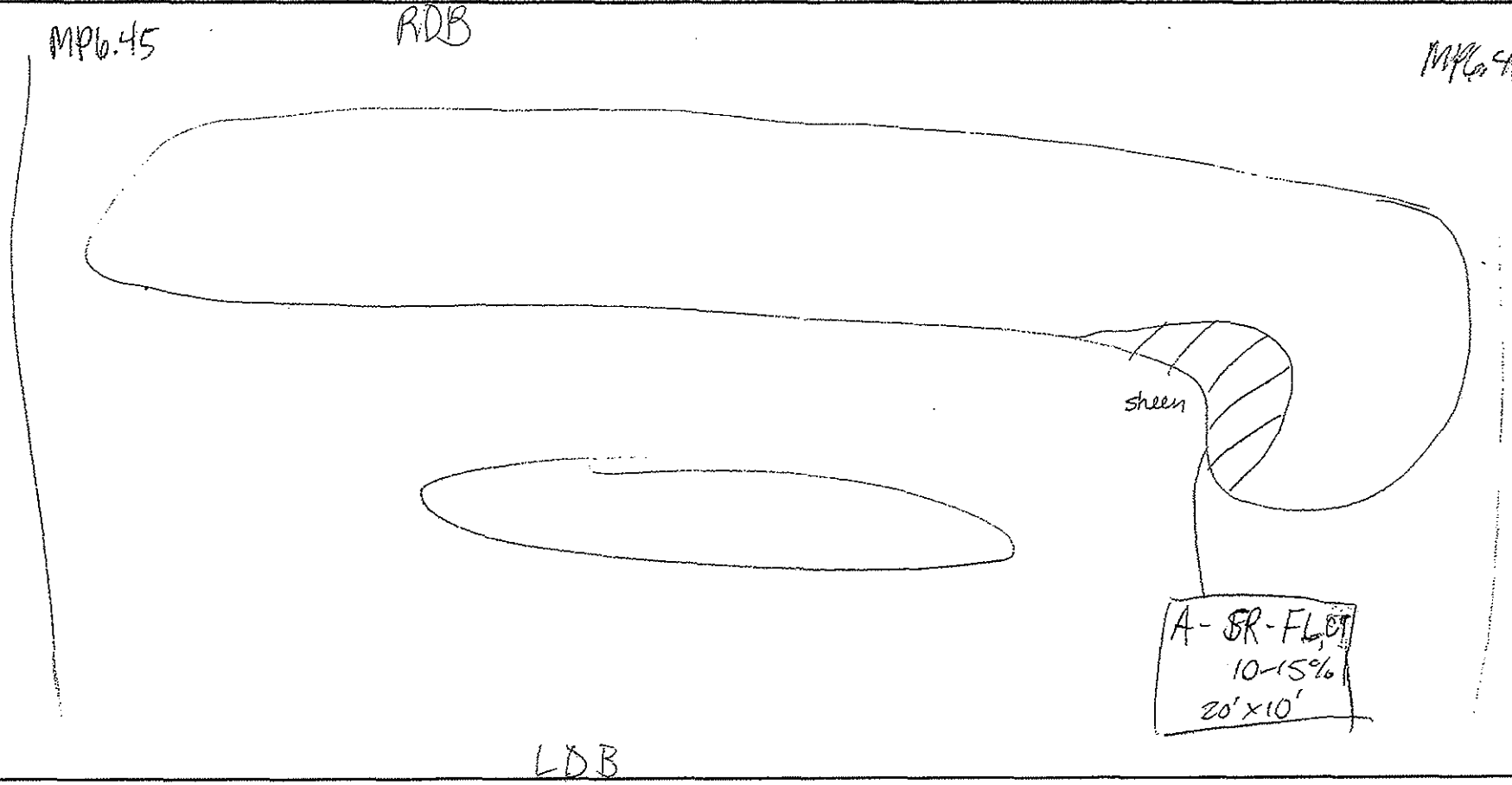
0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

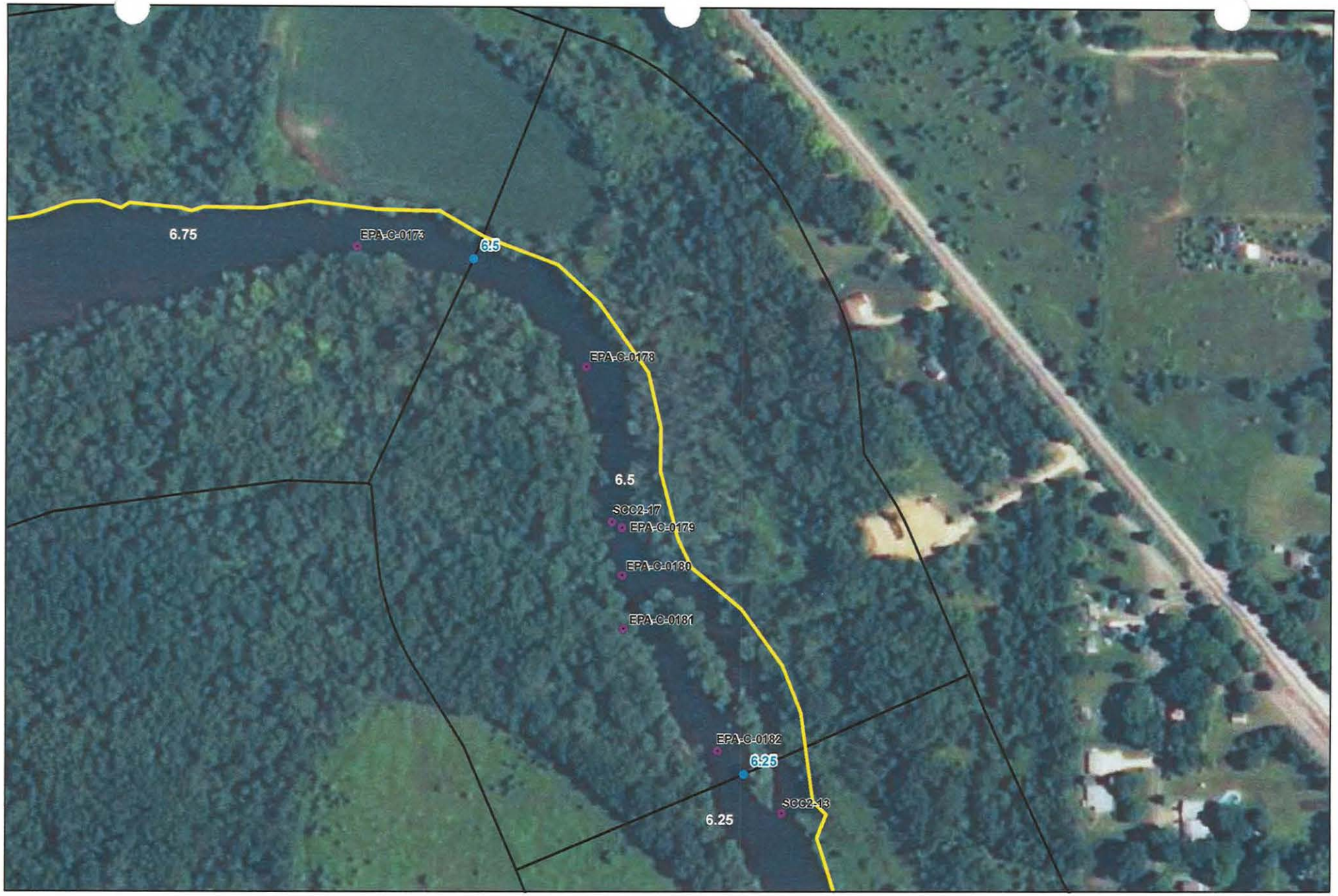
Island - Crews had removed most of the veg. and
A - mucky area causing a sheen in the river. recommend boom placement.
some oiled woody veg noted on banks.

8 SKETCH



OPERATIONS CLEANU. .ECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 6.25-6.50 Right Bank While Looking Downstream									
* (Zone A)	Shoreline	SCAT-T2 8/20/10					Sheen noted on the water about MP 6.32, upstream of snag, recommend boom placement.		
* (Zone B)	Shoreline/Ove	SCAT-T2 8/20/10					Sediment causing a sheen; recommend pad placement.		
* (Zone C)	Shoreline	SCAT-T2 8/20/10			•	•	MP 6.45 stump & debris CT in river needs removal. 4 crews working on cleanup at the time of assessment.		
* (Zone D)	Overbank	SCAT-T2 8/20/10					No comments provided		
* (Zone E)	Overbank	SCAT-T2 8/20/10					No comments provided		
* (Zone F)	Overbank	SCAT-T2 8/20/10					No comments provided		
* (Zone G)	Overbank	SCAT-T2 8/20/10					Sediment causing a sheen; recommend pad placement.		





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 6.25 - 6.5
Right Bank While Looking Downstream

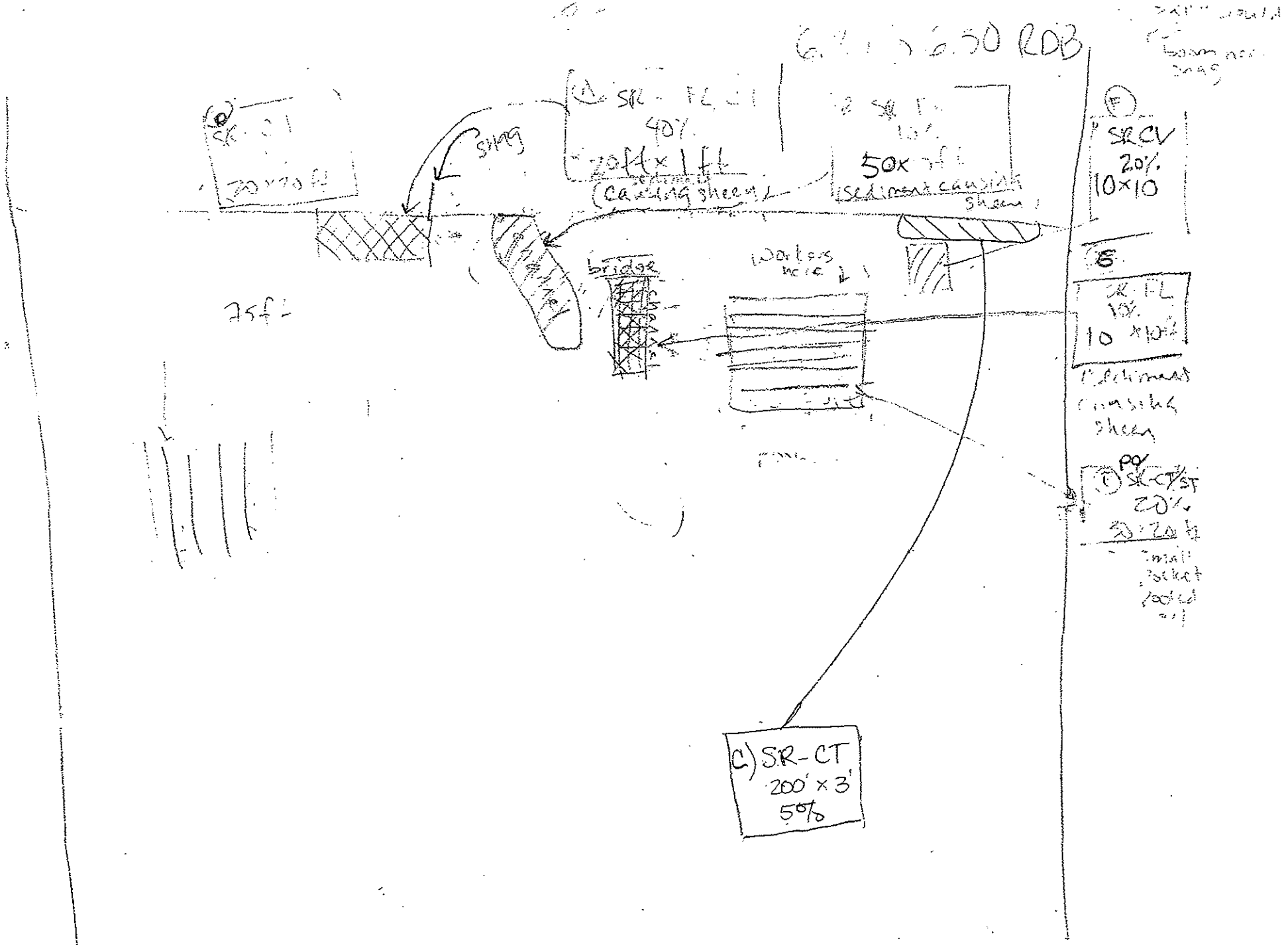
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Division C: Mile Marker 6.25 - 6.50 Right Bank while looking downstream

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/5/10 **Time: AM / PM** 1100 HRS

Operations Division: C **Segment ID: From** 6.25 **Start MP to End MP** 6.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank:** LOB/ROB (6.5)

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

ALL REQUIREMENTS MET/COMPLETED.
AREA'S GREENED OFF.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

ALL REQUIREMENTS MET/COMPLETED.
AREA'S GREENED OFF

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 8/28/10 Time: AM / PM

Operations Division:_____ Segment ID: From 6.25 Start MP to End MP 6.5 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

EPA Inspector: Margaret Gielewski

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): TJ Engstrom

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090510 **Time: AM / PM** 1230

Operations Division: C **Segment ID: From** 6.25 **Start MP to End MP** 6.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

Reviewed 8 areas outlined by SCAT
Corrective action needed is veg + debris removal.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Corrective action complete

Punchlist Items Identified

☑ **Punchlist Items Complete** (add check on punchlist item when completed)

Additional veg removal on island.

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 6.25-6.50 Left Bank While Looking Downstream										
SCC2-17			Shoreline	Shoreline Assessment 8/6/2010	•		•	•	Log jams with floating oil.	(Y) / N
EPA-C-0182			Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods					(Y) / N
EPA-C-0181			Shoreline	SCAT-T2 8/17/2010					Active vegetation cutting and overhanging debris.	(Y) / N
EPA-C-0180			Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods					(Y) / N
EPA-C-0179			Unknown	SCAT-T2 8/17/2010			•		Some Trimming. No active remediation	(Y) / N
EPA-C-0178			Main Channel	SCAT-T2 8/17/2010			•		Some trimming. No active remediation.	(Y) / N

COMMENTS:

1.) CLEAN UP RECOMMENDATIONS FOLLOWED, BUT SOME COARSE LOG/DEBRIS SUSPENDED ABOVE RIVER WITHIN FIRST 4-500' DOWNSTREAM OF MP 6.25.

2.) RED BANNER FLAGS MARKING WITHIN 100' DOWNSTREAM OF MP 6.25; POSSIBLY INDICATING SMALL 4x4 AREA OF SHEEN ON SOIL, +/- 6' SOUTH OF SHORE LINE.

MIKE ZAMBETTIS 9/3/10

Dane Strouse 9/3/10

BILL BATTES 9/3/10

SCAT REASSESSMENT CONCLUSIONS

ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
* (Zone G)			Overbank	SCAT-T2 8/20/10					Sediment causing a sheen; recommend pad placement.	(Y) / N

COMMENT: ① LIMITED 3'X15' SHEEN AREA ON SOIL - POSSIBLY COMING OFF MANACOUT 7" LOG W/OIL STAIN, REMOVE/DISPOSE TOP 1-2" OF OILY SOIL (GPS POINT 001)
N42° 16.495'
W85° 04.006'

Dana Strouse MDNRE 9/3/10
Bill Bates EPA 9/3/10
Mike Zambetis Enbridge 9/3/10

SCAT REASSESSMENT CONCLUSIONS

ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 6.25-6.50 Island										
* (Zone A)			Shoreline	SCAT-T1 8/20/10					Stain and some residual on the shoreline. Recommend to scrape it and discard.	(Y) / N
* (Zone B)			Overbank	SCAT-T2 8/20/10					Patch on the interior of the island that has been cleaned by a crew already. Vegetation is cut, but some tar and residue still remains. Can be raked and discarded. Note another island exactly east, assessment of that island performed by Team #2.	(Y) / N

Island 1
1) Followed Clean up Recommendations. Mucky area is still causing a sheen, Boom is in place and should be maintained.

Dana Strause MDARD 9/3/10
Mike Zambetis - Enbridge 9/3/10
Bill Bates - EPA 9/3/10

SCAT REASSESSMENT CONCLUSIONS										
ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 6.25-6.50 Right Bank While Looking Downstream										
* (Zone A)			Shoreline	SCAT-T2 8/20/10					Sheen noted on the water about MP 6.32, upstream of snag, recommend boom placement.	(Y) / N
* (Zone B)			Shoreline/Over	SCAT-T2 8/20/10					Sediment causing a sheen; recommend pad placement.	(Y) / N
* (Zone C)			Shoreline	SCAT-T2 8/20/10			•	•	MP 6.45 stump & debris CT in river needs removal. 4 crews working on cleanup at the time of assessment.	(Y) / N
* (Zone D)			Overbank	SCAT-T2 8/20/10					No comments provided	(Y) / N
* (Zone E)			Overbank	SCAT-T2 8/20/10					No comments provided	(Y) / N
* (Zone F)			Overbank	SCAT-T2 8/20/10					No comments provided	(Y) / N

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

29 Aug 10

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 6.25 **to MP** 6.50 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAUX	8/29/10 (date)	Enbridge
M.J. Nalipinski Signature M.J. NALIPINSKI	29 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBETIS	9/3/10 (date)	Enbridge
Signature WILLIAM J. BATES	9/3/10 (date)	EPA
Dana Strouse Signature Dana Strouse	9/3/10 (date)	MDNRE

5. **EPA**

Signature	9/17/10 (date)	EPA Division Supervisor

Inspected 9/17
OK to remove sorbent boom against shoreline between LDB MP marker and island Maintain boom in areas where backwater is present CW.

Appendix E
Photos



Photo 0057 – Looking south at left descending bank. Near EPA-C-0182.



Photo 0059 – Looking south at left descending bank. Near EPA-C-0182



Photo 0060 – Looking southeast at left descending bank. Near EPA-C-0181.



Photo 0064 – Looking south at left descending bank. Near EPA-C-0181.



Photo 0065 – Looking north at left descending bank. Near EPA-C-0180.



Photo 0066 – Looking southeast at left descending bank. Near EPA-C-0180.



Photo 0067 – Looking east at left descending bank. Near EPA-C-0180.



Photo 0069 – Looking east at left descending bank. Near EPA-C-0179 & SCC2-17.



Photo 0071 – Looking southeast at left descending bank. Near EPA-C-0179 & SCC2-17.



Photo 0072 – Looking northeast at left descending bank. EPA-C-0179 & SCC2-17.



Photo 0073 – Looking southeast at left descending bank. Near EPA-C-0178.

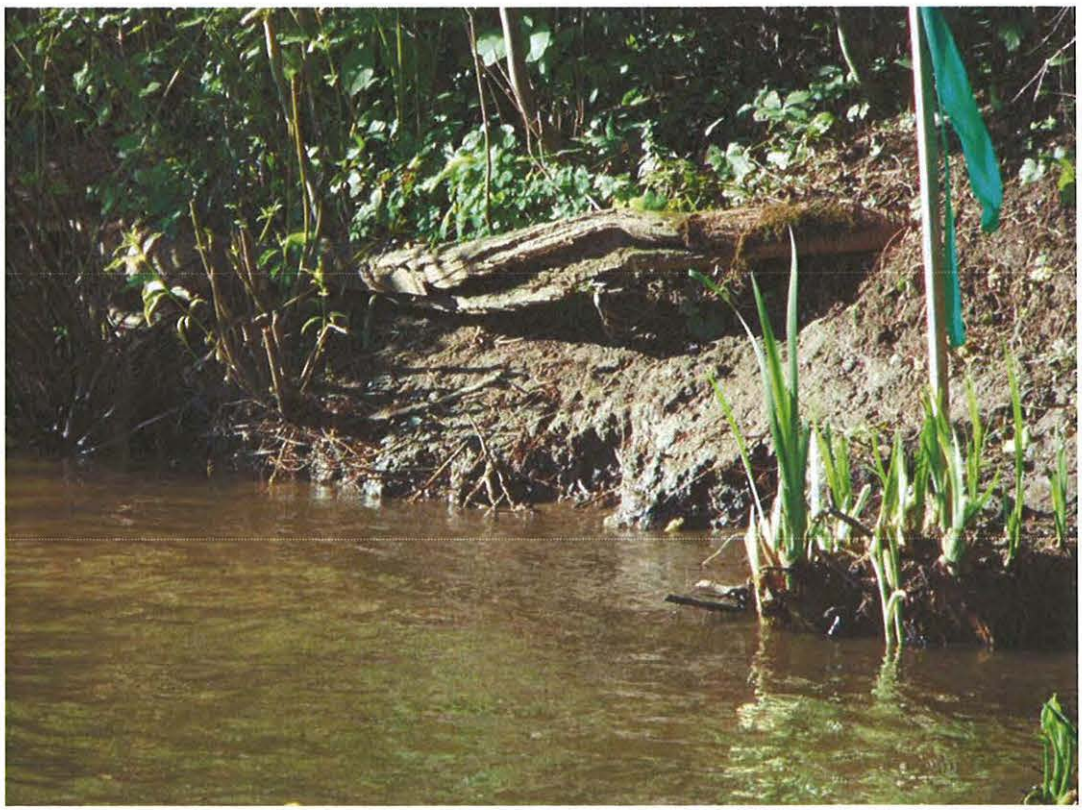


Photo 0075 – Looking southeast at left descending bank. Near EPA-C-0178.



Photo 0076 – Looking south at left descending bank. Near EPA-C-0178.



Photo 0077 – Looking south at left descending bank. Near EPA-C-0178.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 6.75 – MP 6.50 to 6.75

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 6.75 had light oiling and oiled debris on the left and right descending bank. The shoreline of the island had sporadic oiled soil and roots. The overbank areas contained no areas of oil requiring clean-up. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 6.75 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris
- Removal of overhanging vegetation

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled trees, stained vegetation and logs remain on left and right descending bank
- Oiled soil, trees, and roots remain on the island

Segment 6.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

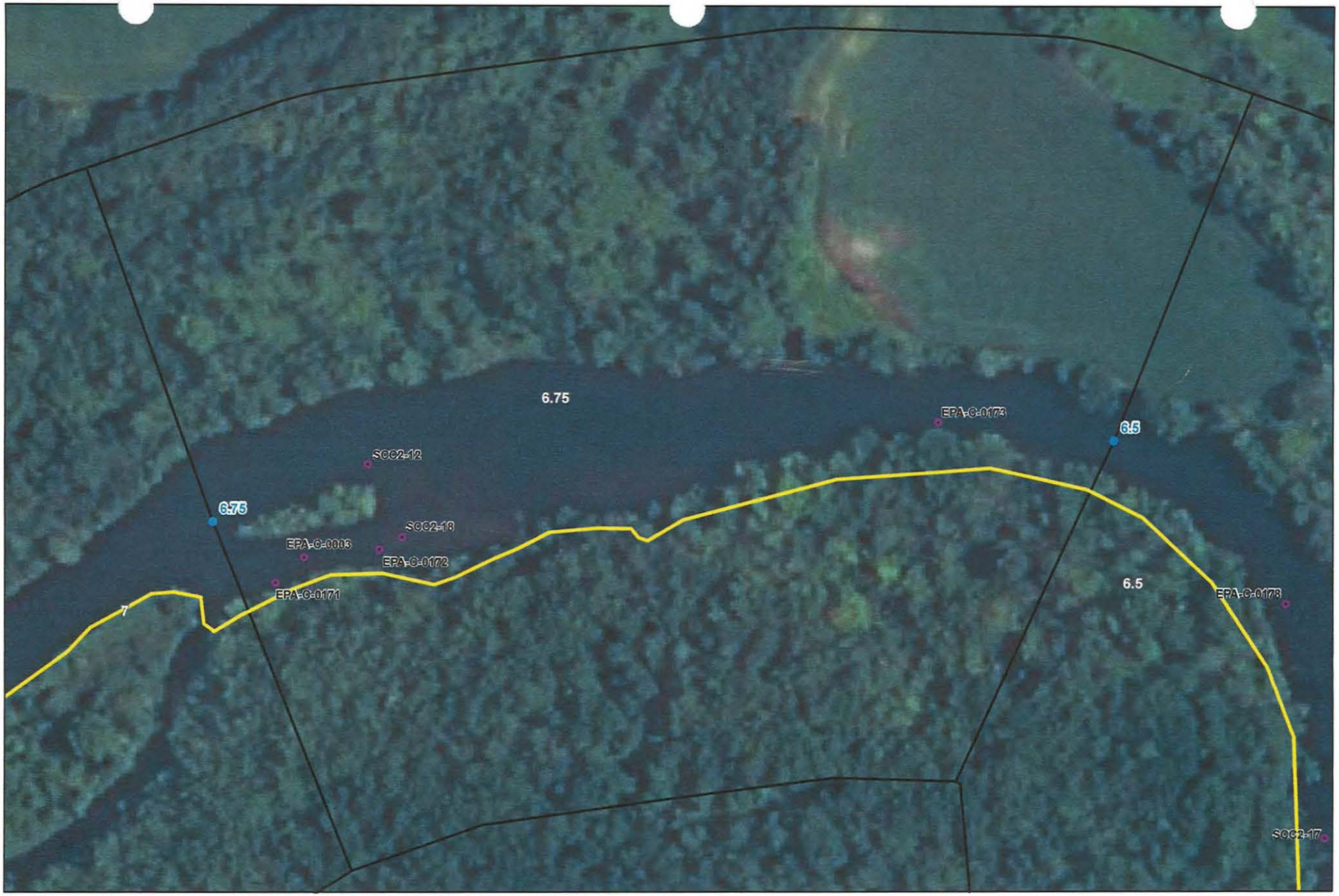
Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS									
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 6.50-6.75 Left Bank While Looking Downstream									
SCC2-18	Shoreline	Shoreline Assessment 8/6/2010	•		•	•			
EPA-C-0173	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods						
EPA-C-0172	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods						
EPA-C-0003	Main Channel	SCAT-T1 8/15/2010					Need a boom for along shoreline -mousse, sheens, 'silver' (100' length)		
EPA-C-0171	Unknown	SCAT-T2 8/17/2010							





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 6.5 - 6.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX

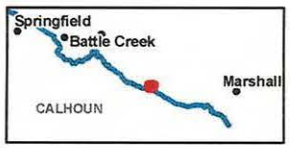
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 6.50-6.75 Right Bank While Looking Downstream									
SCC2-12	Shoreline	Shoreline Assessment 8/6/2010	?		•	•	Island - some areas of high impact.		





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Oper. Focus Areas
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No Oil Observed
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Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/5/10 **Time: AM / PM** 1200 HRS

Operations Division: C **Segment ID: From** 6.5 **Start MP to End MP** 6.75 **Segment Length: 0.25 mile**

Bank: (LDB / RDB) ☑ **Island** **Overbank: LOB/ROB** (6.75)

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

ALL SCAT REQUIREMENTS MET.
ISLAND PUNCH LIST ITEMS COMPLETE TO MATRIX.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

ALL SCAT REQUIREMENTS MET/COMPLETED.
PUNCH LIST ISLAND COMPLETED = FLUSHED/CLEARED/BOOMED.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9/3/2010 Time: AM / PM

Operations Division: C Segment ID: From 6.50 Start MP to End MP 6.75 Segment Length: 0.25 mile

Bank: (LDB) (RDB) ☒ Island

Weather: Sun/Cloud/Rain/Snow/ SUNNY 69°F

Field Inspection Team

EPA Inspector: Andrew W. Smith

Enbridge Inspector: CHRISTOPHER HAUK

Division Supervisor(Contractor): Eric Haugstad

SCAT Reviewed – Description of Clean Up Required

OSHORELINE OILED VEGITATION REMOVAL
OISLAND VEGITATION CLEAR- BOOM OIL CONTAINMENT

Clean Up Performed – Description of Clean Up Complete

☒ **SCAT Requirements/Clean Up Complete**

OSHORELINES CLEARED - NO OILY VEGITATION, ALL DEBRIS REMOVED UNDER FOUR INCHES
OISLAND CLEARED OF VEGITATION and FLUSHED OF OIL.
- BOOM LEFT IN PLACE and MAINTAINED.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090510 **Time: AM / PM** 1745

Operations Division: C **Segment ID: From** 6.5 **Start MP to End MP** 6.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Reviewed – Description of Clean Up Required

Reviewed 5 items outlined by SCAT

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Corrective action needed was veg + debris removal.

Punchlist Items Identified

☑ **Punchlist Items Complete** (add check on punchlist item when completed)

Flushing needed on south side of island.

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 6.50-6.75 Left Bank While Looking Downstream										
SCC2-18			Shoreline	Shoreline Assessment 8/6/2010	•		•	•		(Y) / N
EPA-C-0173			Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods					(Y) / N
EPA-C-0172			Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods					(Y) / N
EPA-C-0003			Main Channel	SCAT-T1 8/15/2010					Need a boom for along shoreline -mousse, sheens, 'silver' (100' length)	(Y) / N
EPA-C-0171			Unknown	SCAT-T2 8/17/2010						(Y) / N

Survey Team Printed Names: Mike Van Loan (Enbridge), Gary Andrew (EPA), Ken Mroczkowski (MDNRE)

Date: September 4, 2010

Comments: Oil on roots along bank on island. Sporadic oily soil on island.

SCAT REASSESSMENT CONCLUSIONS										
ID	Latitude	Longitude	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	SCAT Reassessment Satisfactory?
Division C: Mile Marker 6.50-6.75 Right Bank While Looking Downstream										
SCC2-12			Shoreline	Shoreline Assessment 8/6/2010	?		•	•	Island - some areas of high impact.	(Y) / N

Survey Team Printed Names: Mike Van Loan (Enbridge), Gary Andrew (EPA), Ken Mroczkowski (MDNRE)

Date: September 4, 2010

Comments:

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 6.50 **to MP** 6.75 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

09.03.10 Enbridge
Signature (date)

9/3/10 EPA
Signature (date)

4. **SCAT Reassessment**

09/04/2010 Enbridge
Signature (date)

9.4.10 EPA
Signature (date)

9-4-10 MDNRE
Signature (date)

5. **EPA**

9/17/10 EPA Division Supervisor
Signature (date)

Boom on ~~LB~~ LDB of island
still effective. Maintain in
O+M

Inspected 9/17/10

OSC was present for cleanup ops of these points. ~~Light~~ Slight sheening
on LDB of island. Maintain in O+M.

Appendix E
Photos



Photo 0080 - Looking south at left descending bank. Near EPA-C-0173.



Photo 0078 – Looking south at left descending bank. Near EPA-C-0173.



Photo 0082 – Looking southeast along island shoreline and mud plain. Near SCC2-12,SCC2-18, EPA-C-0172, EPA-C-0003, and EPA-C-0171



Photo 0086 – Looking west at island shoreline and mud plain. Near SCC2-12,SCC2-18, EPA-C-0172, EPA-C-0003, and EPA-C-0171



Photo 0090 – Looking west at island shoreline and mud plain. Near SCC2-12,SCC2-18, EPA-C-0172, EPA-C-0003, and EPA-C-0171



Photo 0091 – Looking east at island shoreline and mud plain. Near SCC2-12,SCC2-18, EPA-C-0172, EPA-C-0003, and EPA-C-0171



Photo 0094 – Looking southeast at island shoreline and mud plain. Near SCC2-12,SCC2-18, EPA-C-0172, EPA-C-0003, and EPA-C-0171



Photo 0095 – Looking north at island shoreline and mud plain. Near SCC2-12,SCC2-18, EPA-C-0172, EPA-C-0003, and EPA-C-0171

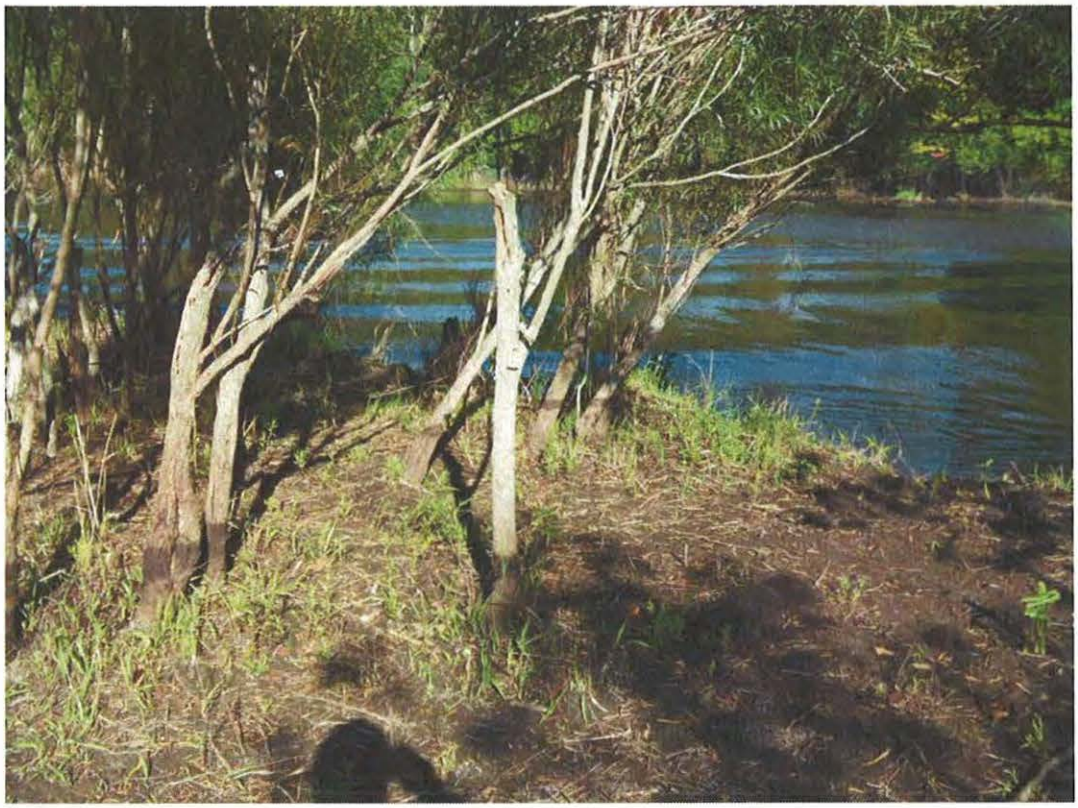

Photo 100 – Looking northwest at island shoreline and mud plain. Near SCC2-12,SCC2-18, EPA-C-0172, EPA-C-0003, and EPA-C-0171



Photo 105 – Looking southwest at island shoreline and mud plain. Near SCC2-12,SCC2-18, EPA-C-0172, EPA-C-0003, and EPA-C-0171

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 7.00 – MP 6.75 to 7.00

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 7.00 had light oiling on the left and right descending bank. The left descending bank had oiled debris and vegetation. The right descending bank had some oiled vegetation. Island shorelines had oiled vegetation and debris with some oiling in island interior, overbank areas contained no areas of oil requiring clean-up. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 7.00 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris
- Removal of overhanging vegetation

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oil stained trees and woody vegetation remain on left and right descending banks near MP 6.75
- Oiled vegetation remain on the downstream island shorelines and in over bank on largest island
- Oiled logs in river remain near MP7
- Oiled rock and cobble shoreline right descending bank downstream of MP 6.75

Segment 7.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
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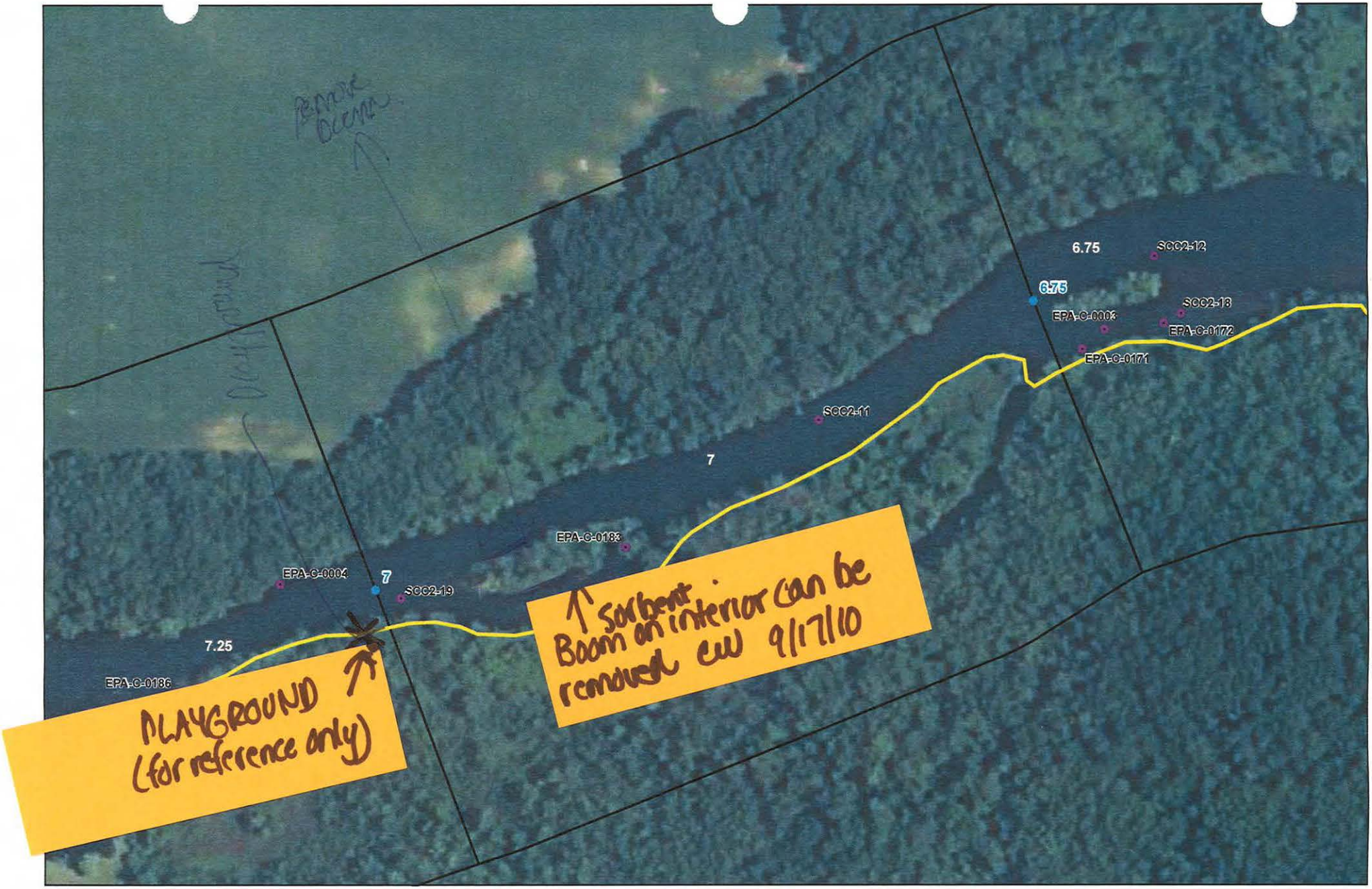
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

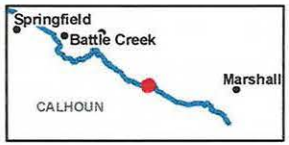
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 6.75-7.00 Left Bank While Looking Downstream									
SCC2-19	Shoreline	Shoreline Assessment 8/6/2010	•			•			
EPA-C-0183	Main Channel	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0171	Main Channel	SCAT-T2 8/17/2010			•		Shoreline vegetation coated with surface oil residue.		
EPA-C-0172	Main Channel	SCAT-T2 8/17/2010				•	Woody debris coated with tar.		





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 6.75 - 7.0
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

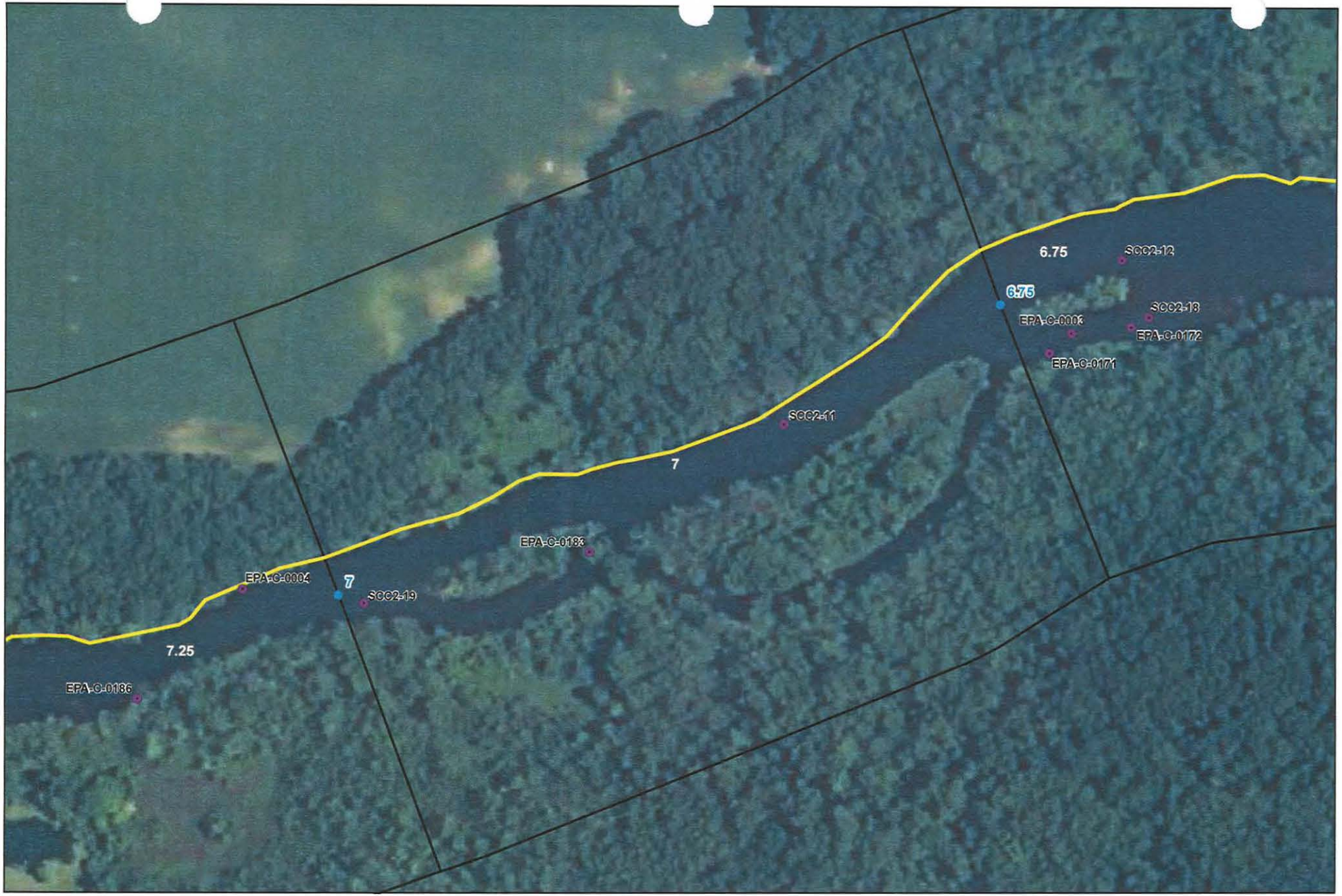
0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP .COMMENDATIONS									
	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 6.75-7.00 Right Bank While Looking Downstream									
SCC2-11	Shoreline	Shoreline Assessment 8/6/2010			•				





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 6.75 - 7.0
Island t Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/2/10 **Time: AM / PM** 1600 HRS

Operations Division: C **Segment ID: From** 6.75 **Start MP to End MP** 7 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB** (7)

Weather: Sun/Cloud/Rain/Snow/ CLOUD/RAIN

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9/3/2010 Time: AM / (PM) 1:45

Operations Division: C Segment ID: From 6.75 Start MP to End MP 7.00 Segment Length: 0.25 mile

Bank: (LDB) / (RDB) ☐ Island

Weather: Sun/Cloud/Rain/Snow/ SUNNY 69° F

Field Inspection Team

EPA Inspector: Andrew M. Smith

Enbridge Inspector: CHRISTOPHER HAUX

Division Supervisor(Contractor): Eric Haugstad

SCAT Reviewed – Description of Clean Up Required

- LIGHT SHORE LINE IMPACT
- REMOVE OILY VEGITATION
- ISLAND VEGITATION and DEBRIS REMOVED, BOOM OIL CONTAINMENT

Clean Up Performed – Description of Clean Up Complete

☒ **SCAT Requirements/Clean Up Complete**

- SHORELINES CLEARED - NO OILY VEGITATION, ALL OILY DEBRIS REMOVED UNDER FOUR INCHES
- ISLAND CLEAR OF VEGITATION and EDGES FLUSHED AS NEEDED.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090210 Time: AM / (PM) 1630

Operations Division: C Segment ID: From 6.75 Start MP to End MP 7 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/ Cloud / Rain

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

Reviewed 2 areas outlined by SCAT.
Corrective action needed was vegetation + debris removal.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Vegetation + debris have been removed.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Vegetation along LSD coated with oil mats to be removed.

Cut debris piled on coated herbaceous vegetation

Appendix C
Step 4 – SCAT Reassessment Documentation

7.0 LDB V-list/sign-off

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 6.75-7.00 Left Bank While Looking Downstream										
SCC2-19	Shoreline	Shoreline Assessment 8/6/2010	•			•				Y / N
EPA-C-0183	Main Channel	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							Y / N
EPA-C-0171	Main Channel	SCAT-T2 8/17/2010			•		Shoreline vegetation coated with surface oil residue.			Y / N
EPA-C-0172	Main Channel	SCAT-T2 8/17/2010				•	Woody debris coated with tar.			Y / N

Printed Team Members Names: ~~Gary Andrew - EPA/Kathleen Foley - EPA/Chris Clampitt - MDNRE/Glen VandeWater~~
Date: 9/7/16
Comments: MIKE ZAMBETIS, BILL BATES, Dana Strouse

WP: 049: N 42.27509 pooled ~~oil~~ oil on small island
W-085.07680

- sticky veg in over bank on small island downstream end. material water ~~[illegible]~~ sheen tested. no sheen or very minor sheen deemed ok to leave.

- sticky veg in over bank on large island (~near way point for large island

- W.P. N 42.27514 - pooled oil on large island
W-85.07552

-,0 RDB

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 6.75-7.00 Right Bank While Looking Downstream										
SCC2-11	Shoreline	Shoreline Assessment 8/6/2010			•					(Y) N

Printed Team Members Names: ~~Gary Andrew - EPA/Kathleen Foley - EPA/Chris Clampitt - MDNRE/Glen Vande Water - NRG~~ BILL BATES, MIKE ZAMBETTIS, Dana Strouse

Date: 9/7/10

Comments:

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 6.75 **to MP** 7.00 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

09.03.10 Enbridge
Signature (date)

9/3/10 EPA
Signature (date)

4. **SCAT Reassessment**

9/7/10 Enbridge
Signature MICHAEL A. ZAMBERS (date)

9/7/10 EPA
Signature WILLIAM BATES (date)

9/7/10 MDNRE
Signature Dana Strouse (date)

5. **EPA**

9/17/10 EPA Division Supervisor
Signature (date)

Inspected 9/17/10. Div. Sup was present when cleanup actions were performed OK to remove sorbent boom from LB of small island near ox bow. CW.

Appendix E
Photos



Photo 0178 - Looking northwest at the right descending bank. Near SCC2-11.



Photo 0181 - Looking northeast at the right descending bank. Near SCC2-11.



Photo 0185 - Looking east at island. Near EPA-C-0183.



Photo 0186 - Looking west at island. Near EPA-C-0183.



Photo 0188 - Looking west at left descending bank. Near SCC2-19.



Photo 0191 - Looking southwest at left descending bank. Near SCC2-19.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 7.25 – MP 7.00 to 7.25

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 7.25 had light oiling on the left and right descending banks. Oiled sediment was observed on the sandy shoreline back into shore of right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 7.25 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris
- Removal of overhanging vegetation

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oily rocks, logs, cobbles and vegetation including trees remain on left descending bank
- Oiled trees, soil and low vegetation remain on right descending bank near EPA-C-0186
- Oily debris and mousse remain near EPA-C-0184
- Oiled soil on right descending bank remains with required operation and maintenance activities. Operation and maintenance activities will consist of containment and absorbent booming strategies as required

Segment 7.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

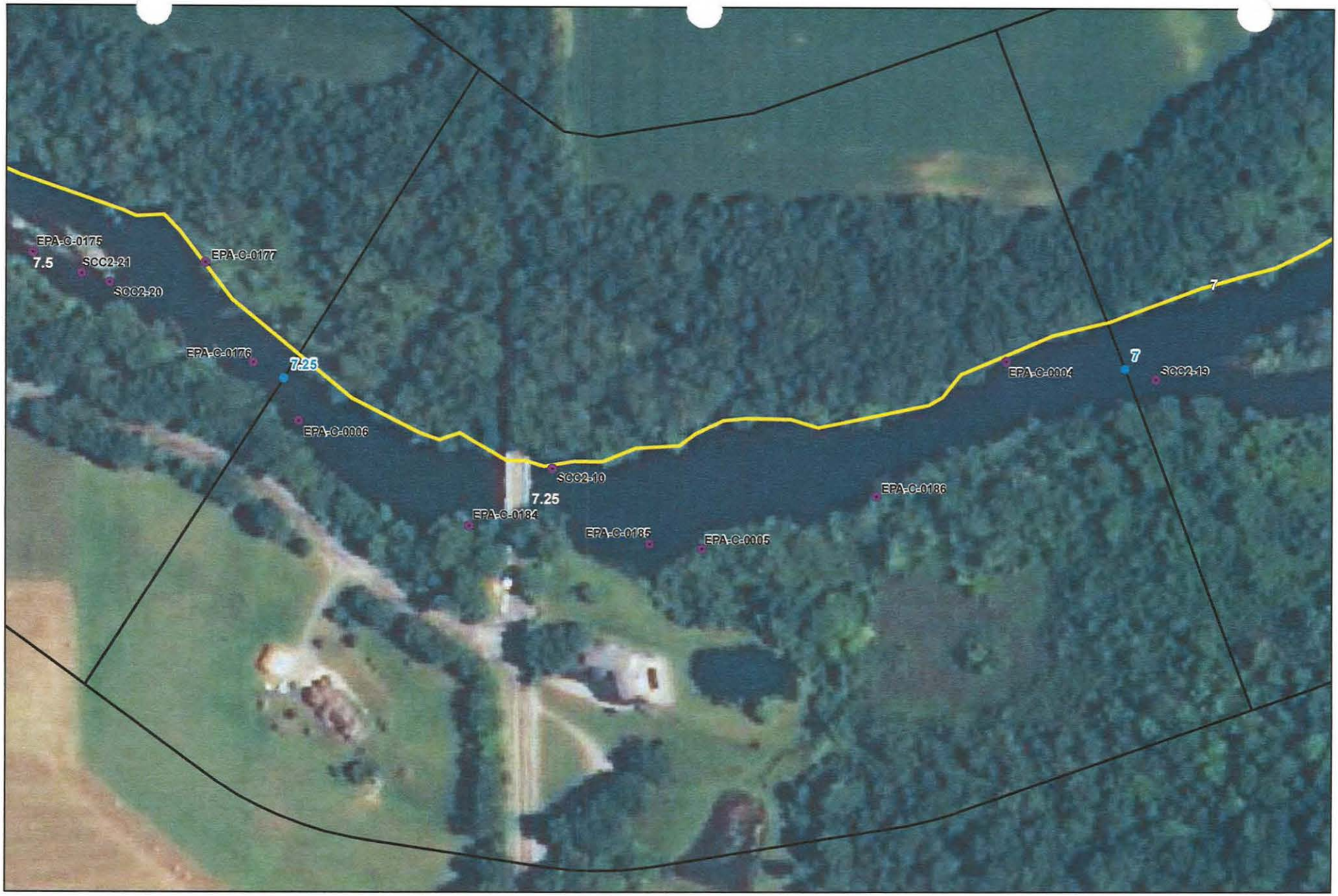
Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS									
	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 7.00-7.25 Left Bank While Looking Downstream									
EPA-C-0186	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0005	Main Channel	SCAT-T1 8/15/2010					Need a boom for along shoreline -mousse, sheens, 'silver' (100' length)		
EPA-C-0185	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0184	Main Channel	SCAT-T2 8/17/2010					Mostly mouse.		
EPA-C-0006	Main Channel	SCAT-T1 8/15/2010					Mostly mouse.		


EPA-C-0175
7.5
SCC2-21
EPA-C-0177
SCC2-20
EPA-C-0176
7.25
EPA-C-0006
SCC2-10
7.25
EPA-C-0184
EPA-C-0185
EPA-C-0005
EPA-C-0186
EPA-C-0004
7
SCC2-19
7
Springfield
Battle Creek
Marshall
CALHOUN
River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment
Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
Division C: Mile Marker 7.0 - 7.25
Left Bank While Looking Downstream
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill
0 75 150
Feet
Source: Aerial Photography: USDA, 2010.
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS									
	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 7.00-7.25 Right Bank While Looking Downstream									
SCC2-10	Shoreline	Shoreline Assessment 8/6/2010	?		•				
EPA-C-0004	Main Channel	SCAT-T1 8/15/2010					WP91 - sandy shoreline has oiled sediment back into shore.		
EPA-C-0007	Main Channel	SCAT-T1 8/15/2010					Lots of cutting overhanging vegetation in this zone. Cutting of vegetation made a big visual improvement. WP90 is leaching oil from muck flat.		





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 7.0 - 7.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/6/10 Time: AM / PM

Operations Division: C Segment ID: From 7 Start MP to End MP 7.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB (7.25)

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA DONE

REQUIREMENTS HAVE BEEN MET TO MATRIX STANDARDS & SCAT.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9/3/2010 **Time: AM (PM)** 1:30

Operations Division: C **Segment ID: From** 7.00 **Start MP to End MP** 7.25 **Segment Length: 0.25 mile**

Bank: (LDB)/(RDB) ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ SUNNY 69°F

Field Inspection Team

EPA Inspector:

Enbridge Inspector: CHRISTOPHER HAUK

Division Supervisor(Contractor): Eric Haugstad

SCAT Reviewed – Description of Clean Up Required

- 5 SHORELINE LIGHTLY IMPACTED
  - REMOVE OILY VEGITATION
  - OILY SAND and GRAVEL
- OILY ROCKS

Clean Up Performed – Description of Clean Up Complete

☒ **SCAT Requirements/Clean Up Complete**

- 5 SHORELINES CLEARED OF VEGITATION, ALL DEBRIS REMOVED UNDER FOUR INCHES
- OILY SAND and GRAVEL and LARGE ROCKS, COLD WATER FLUSHED

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090610 **Time: AM / PM**

Operations Division: C **Segment ID: From** 7 **Start MP to End MP** 7.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Reviewed – Description of Clean Up Required

Reviewed 2 areas outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Veg removal + hand placement

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

60' shoreline skipped by clean up crews that need veg removal

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 7.00-7.25 Right Bank While Looking Downstream										
SCC2-10	Shoreline	Shoreline Assessment 8/6/2010	?		•					Y / N
EPA-C-0004	Main Channel	SCAT-T1 8/15/2010					WP91 - sandy shoreline has oiled sediment back into shore.			Y / N
EPA-C-0007	Main Channel	SCAT-T1 8/15/2010					Lots of cutting overhanging vegetation in this zone. Cutting of vegetation made a big visual improvement. WP90 is leaching oil from muck flat.			Y / N

Printed Team Members Names: MIKE ZAMBETIS, Dana Strouse, BILL BATES

Date: 9/7/10

Comments: WP 090 pooled area
N 42.27493
W -85.08245

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 7.00-7.25 Left Bank While Looking Downstream										
EPA-C-0186	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							Y / N
EPA-C-0005	Main Channel	SCAT-T1 8/15/2010					Need a boom for along shoreline -mousse, sheens, 'silver' (100' length)			Y / N
EPA-C-0185	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							Y / N
EPA-C-0184	Main Channel	SCAT-T2 8/17/2010					Mostly mouse.			Y / N
EPA-C-0006	Main Channel	SCAT-T1 8/15/2010					Mostly mouse.			Y / N

Printed Team Members Names: Dana Strouse, BILL BATES, MIKE ZAMBETTI

Date: 9/7/10

Comments:

Near EPA-C-0184: oly debris and sediment and mouse remain, but there is no clean-up recomendation

near EPA-C-0186 - low veg is tacky and has staining. Way point 59: N:42.27438 W-085.07947

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 7.00 **to MP** 7.25 **Segment Length: 0.25 mile**

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature	(date)	
Ken Costley	06-Sept-2010	Enbridge
	9/6/10	EPA

4. **SCAT Reassessment**

Signature	(date)	
MICHAEL A. ZAMBETIS	9/7/10	Enbridge
William Bates	9/7/10	EPA
Dana Strouse	9/7/10	MDNRE

5. **EPA**

Signature	(date)	
	9/17/10	EPA Division Supervisor

Inspected 9/17/10. Only boom in this area is at house just upstream from bridge (LOB). For O+M, ensure boom is maintained as deflection boom + not containment boom. to prevent collection at residential property.

Appendix E
Photos



Photo 0192 – Looking north at right descending bank. Near EPA-C-0004.



Photo 0194 – Looking north at right descending bank. Near EPA-C-0004.



Photo 0195 – Looking north at right descending bank. Near EPA-C-0004.



Photo 0196 – Looking north at right descending bank. Near EPA-C-0004.



Photo 0198 – Looking southwest at left descending bank. Near EPA-C-0186.



Photo 0199 – Looking south at left descending bank. Near EPA-C-0186.



Photo 0200 – Looking southeast at right descending bank. Near EPA-C-0186.



Photo 0201 – Looking south at left descending bank. Near EPA-C-0186.



Photo 0202 – Looking south at left descending bank. Near EPA-C-0005.

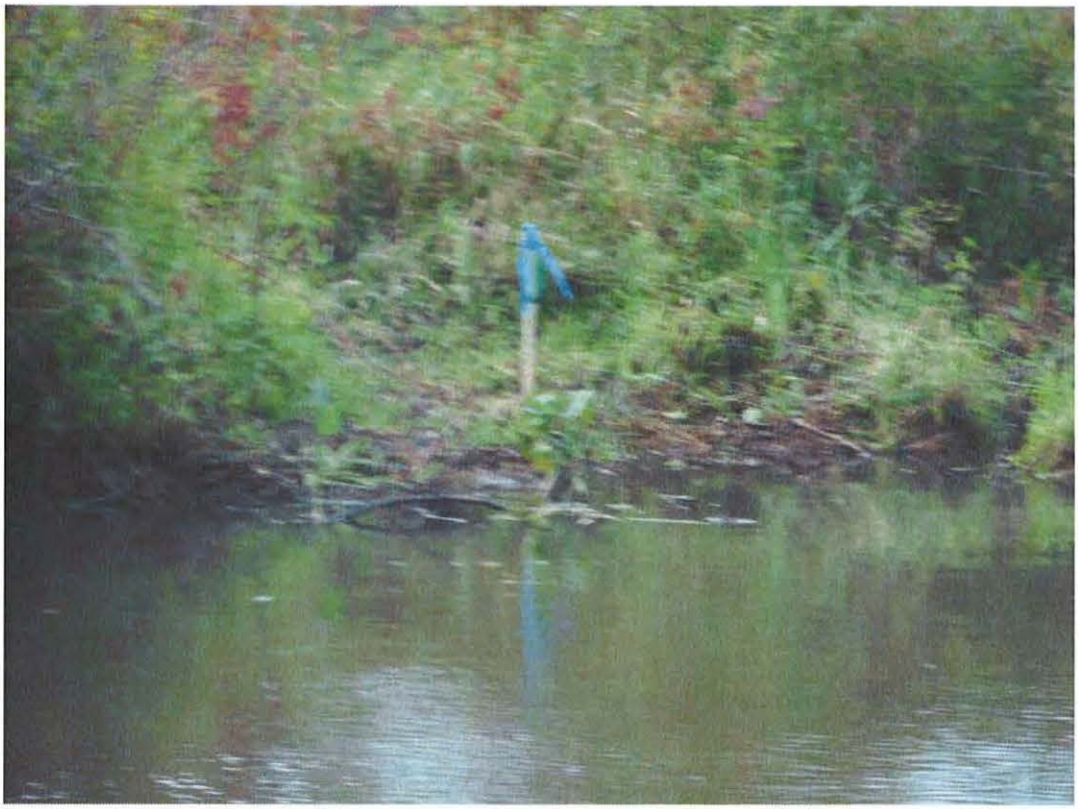


Photo 0203 –Looking south at left descending bank. Near EPA-C-0005.



Photo 0204 – Looking south at left descending bank. Near EPA-C-0005.



Photo 0205 – Looking south at left descending bank. Near EPA-C-0005.



Photo 0206 – Looking south at left descending bank. Near EPA-C-0005.



Photo 0207 – Looking southeast at left descending bank. Near EPA-C-0185.



Photo 0208 – Looking south at left descending bank. Near EPA-C-0186.



Photo 0209 – Looking southwest at left descending bank. Near EPA-C-0185.



Photo 0210 – Looking west at left descending bank. Near EPA-C-0185.



Photo 0212 – Looking east at island right descending bank. Near SCC2-10.



Photo 0213 – Looking southwest at island right descending bank. Near SCC2-10.



Photo 0215 – Looking northwest at island right descending bank. Near SCC2-10.



Photo 0216 – Looking southeast at left descending bank. Near EPA-C-0184.



Photo 082 – Looking west at left descending bank. Zone A: 20'X3' area upstream of GPS point: EPA-C-0230.



Photo 083 – Looking southwest at left descending bank. Zone B: 30'X5" area adjacent to Near EPA-C-0230.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 7.50 – MP 7.25 to 7.50

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 7.50 had light oiling on the left and right descending bank with a small amount of pooled oil observed on the left descending bank. The overbank contained no areas of oil requiring clean-up. Islands present had oiled vegetation and soil. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 7.50 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled vegetation, including trees, remains on the left and right descending banks
- Oily soil remains on a small island near Segment 7.25

Segment 7.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

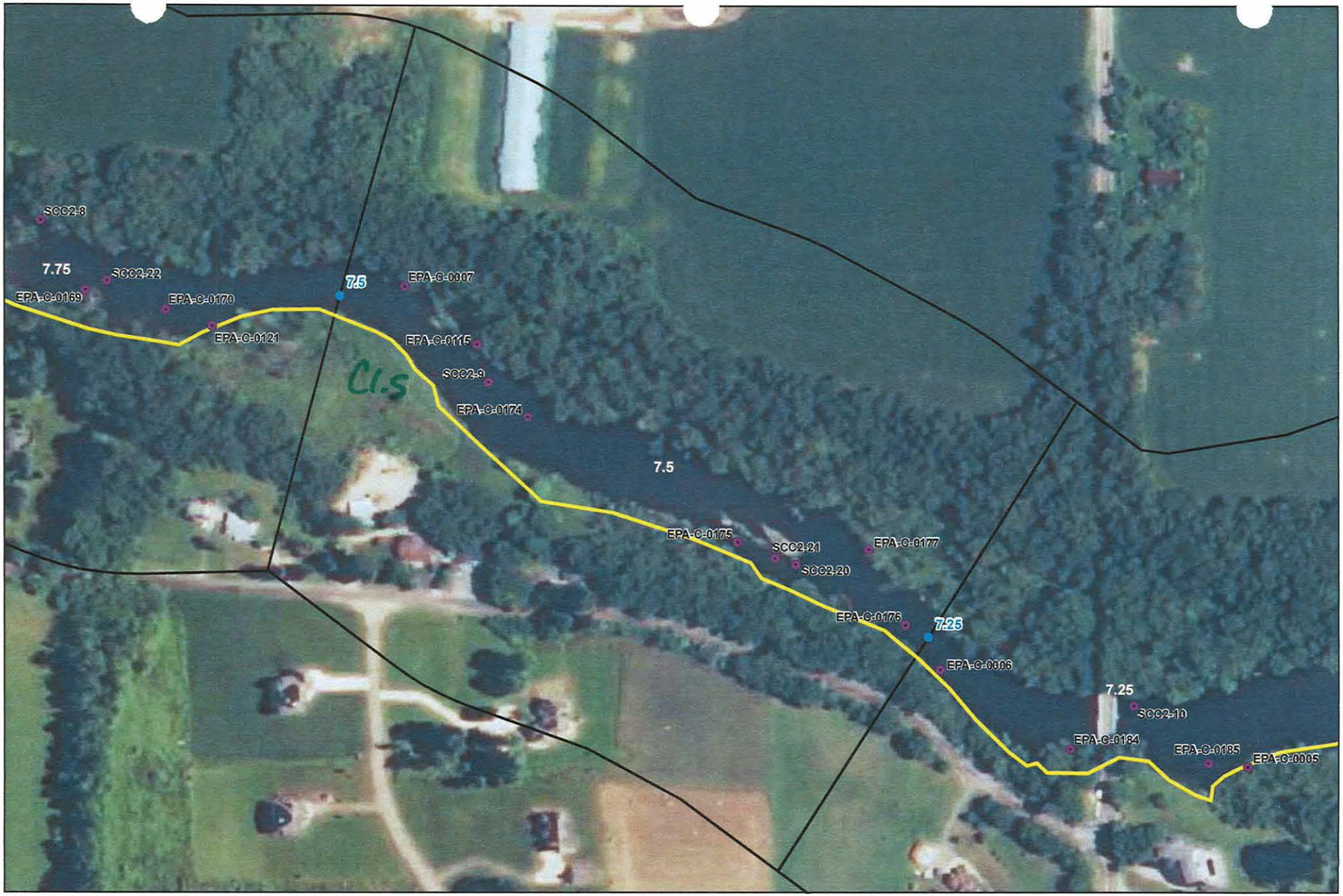
Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

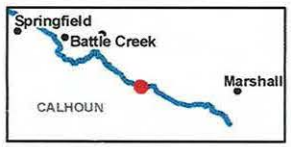
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP . COMMENDATIONS									
	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 7.25-7.50 Left Bank While Looking Downstream									
SCC2-20	Shoreline	Shoreline Assessment 8/6/2010	•		•				
SCC2-21	Shoreline	Shoreline Assessment 8/6/2010	•	•	•		Small grass flat with a small amount of pooled oil.		
EPA-C-0176	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0175	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0174	Main Channel	SCAT-T2 8/17/2010					Shore vegetation cut.		





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 7.25 - 7.5
Left Bank While Looking Downstream

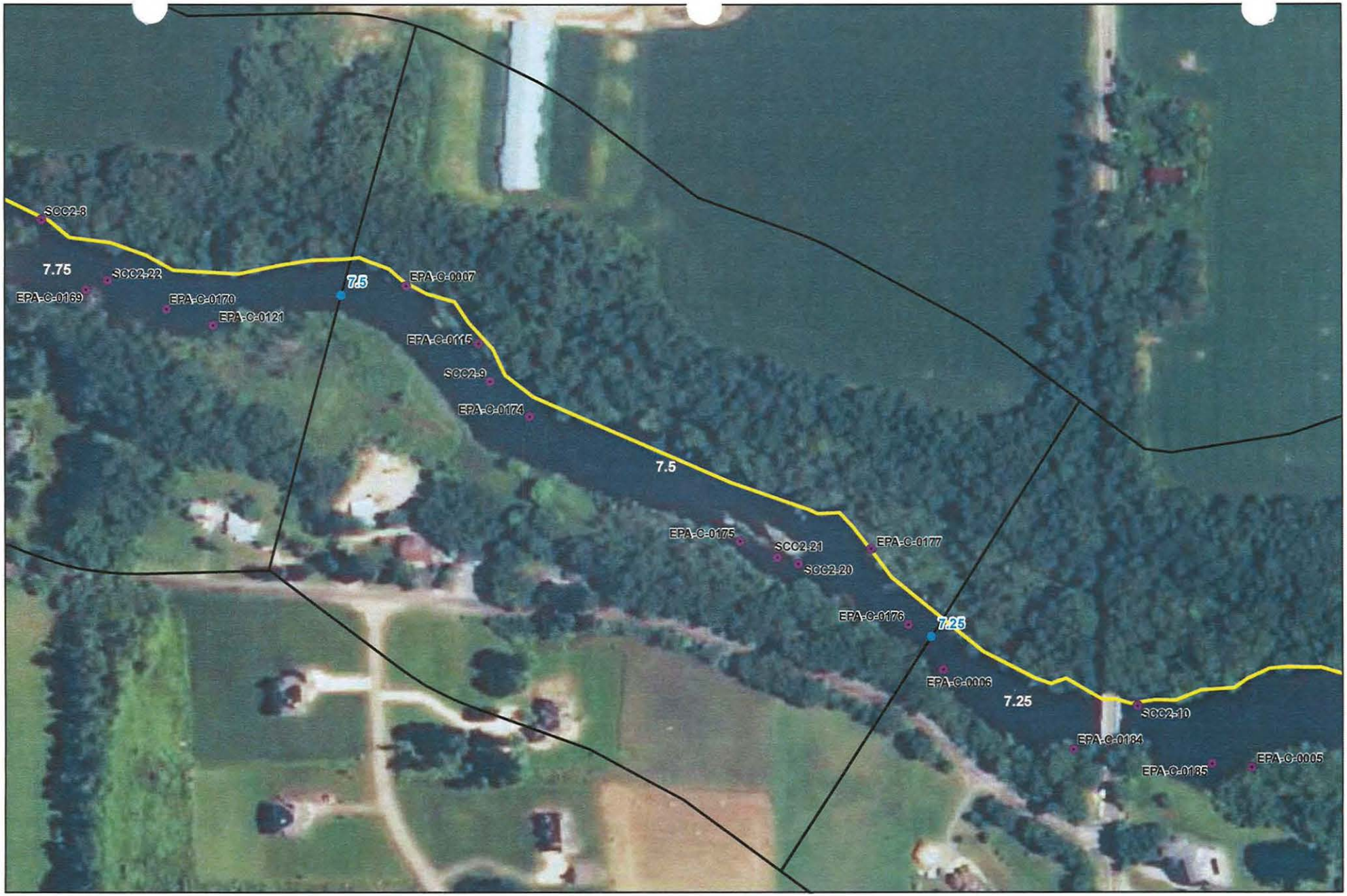
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP & RECOMMENDATIONS									
	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 7.25-7.50 Right Bank While Looking Downstream									
SCC2-9	Shoreline	Shoreline Assessment 8/6/2010			•	•			
EPA-C-0177	Unknown	SCAT-T2 8/18/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0174	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0115	Unknown	SCAT-T1 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0007	Unknown	SCAT-T1 8/15/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 7.25 - 7.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/14/10 Time: AM / PM

Operations Division: C Segment ID: From 7.25 Start MP to End MP 7.5 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

SCAT REQUIRED REFERENCE TO MATRIX. SHORE LINE CLEAR ~~EF~~

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

SCAT REQUIRED REFERENCE TO MATRIX.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9/3/2010 **Time: AM /** (PM) 1:00

Operations Division: C **Segment ID: From** 7.25 **Start MP to End MP** 7.50 **Segment Length: 0.25 mile**

Bank (LDB) / (RDB) ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ SUNNY 69°F

Field Inspection Team

EPA Inspector:

Enbridge Inspector: CHRISTOPHER HAUK

Division Supervisor(Contractor): Eric Haugstad

SCAT Reviewed – Description of Clean Up Required

- WOODY DEBRIS
- SHORELINE VEGITATION REMOVAL
- ISLAND VEGITATION CLEAR - BOOM OIL CONTAINMENT

Clean Up Performed – Description of Clean Up Complete

☒ **SCAT Requirements/Clean Up Complete**

- SHORE LINES CLEAR - NO OILY VEGITATION, ALL DEBRIS REMOVED UNDER FOUR INCHES
- WOODY DEBRIS REMOVED
- ISLAND VEGITATION CLEAR
  - BOOM LEFT IN PLACE and REMOVED

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 04/04/16 **Time: AM / PM**

Operations Division: C **Segment ID: From** 7.25 **Start MP to End MP** 7.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

Reviewed 3 areas outlined by SCAT.
Veg removal + debris removal needed.
1 area of pooled oil

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 7.25-7.50 Right Bank While Looking Downstream										
SCC2-9	Shoreline	Shoreline Assessment 8/6/2010			•	•				(Y) / N
EPA-C-0177	Unknown	SCAT-T2 8/18/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-0174	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-0115	Unknown	SCAT-T1 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-0007	Unknown	SCAT-T1 8/15/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N

Printed Team Members Names: Bill Bates, Mike Zambetis, Dana Strouse

Date: 9/7/10

Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 7.50-7.75 Island										
EPA-C-0122	Shoreline	SCAT-T1 8/21/10	•				Along the shoreline there is still some residue and coating. Tree banding should be left in place but surface residue could be low pressure wash.			(Y) / N
EPA-C-0122	Shoreline	SCAT-T1 8/21/10					Band of stain around island, probably be left alone			(Y) / N
EPA-C-0122	Shoreline	SCAT-T1 8/21/10	•				Tar and surface residue. Tree banding should be left in place but surface residue could be low pressure wash.			(Y) / N
EPA-C-0115	Shoreline	SCAT-T2 8/21/10			•		Remove dead matted vegetation by raking			Y / N
EPA-C-0115	Shoreline	SCAT-T2 8/21/10			•		Remove dead matted vegetation by raking			Y / N
EPA-C-0115	Shoreline	SCAT-T2 8/21/10					Potential hydrocarbon sheen from vegetation breakdown, if oil sheen then absorbent pads			Y / N
EPA-C-0115	Shoreline	SCAT-T2 8/21/10			•		Remove dead matted vegetation by raking			Y / N
										Y / N

Printed Team Members Names: BILL BATES, MIKE ZAMBETTIS, DANA STROUSE
Date: 9/7/10
Comments:

7.50 not 7.75

ON LEFT DOWNSTREAM BANK

ACTUALLY IN SEGMENT 7.5

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 7.25-7.50 Left Bank While Looking Downstream										
SCC2-20	Shoreline	Shoreline Assessment 8/6/2010	•		•					(Y) / N
SCC2-21	Shoreline	Shoreline Assessment 8/6/2010	•	•	•		Small grass flat with a small amount of pooled oil.			(Y) / N
EPA-C-0176	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-0175	Unknown	SCAT-T2 8/17/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-0174	Main Channel	SCAT-T2 8/17/2010					Shore vegetation cut.			(Y) / N

Printed Team Members Names: BILL BATES, Dana Strouse, MIKE ZAMBETIS

Date: 9/7/10

Comments:

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 7.25 **to MP** 7.50 **Segment Length: 0.25 mile**

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley (date) 06-Sept-2010 Enbridge

Signature (date) 9/6/10 EPA

4. **SCAT Reassessment**

Signature (date) 9/7/10 Enbridge

Signature WILLIAM BATES (date) 9/7/10 EPA

Signature Dana Stouse (date) 9/7/10 MDNRE

5. **EPA**

Signature (date) 9/18/10 EPA Division Supervisor

Field inspected 9/18/10 - Looks good! CW

Appendix E
Photos



Photo 0202 – Looking south at left descending bank. Near EPA-C-0005.



Photo 0204 – Looking south at left descending bank. EPA-C-0005.



Photo 0205 – Looking south at left descending bank. EPA-C-0005.



Photo 0206 – Looking south at left descending bank. EPA-C-0005.



Photo 0227 – Looking east at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0228 – Looking west at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0229 – Looking northwest at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0230 – Looking north at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0231 – Looking east at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0232 – Looking southeast at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0233 – Looking south at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0234 – Looking southwest at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0235 – Looking west at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0236 – Looking west at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0237 – Looking east at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0238 – Looking northeast at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0239 – Looking north at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.

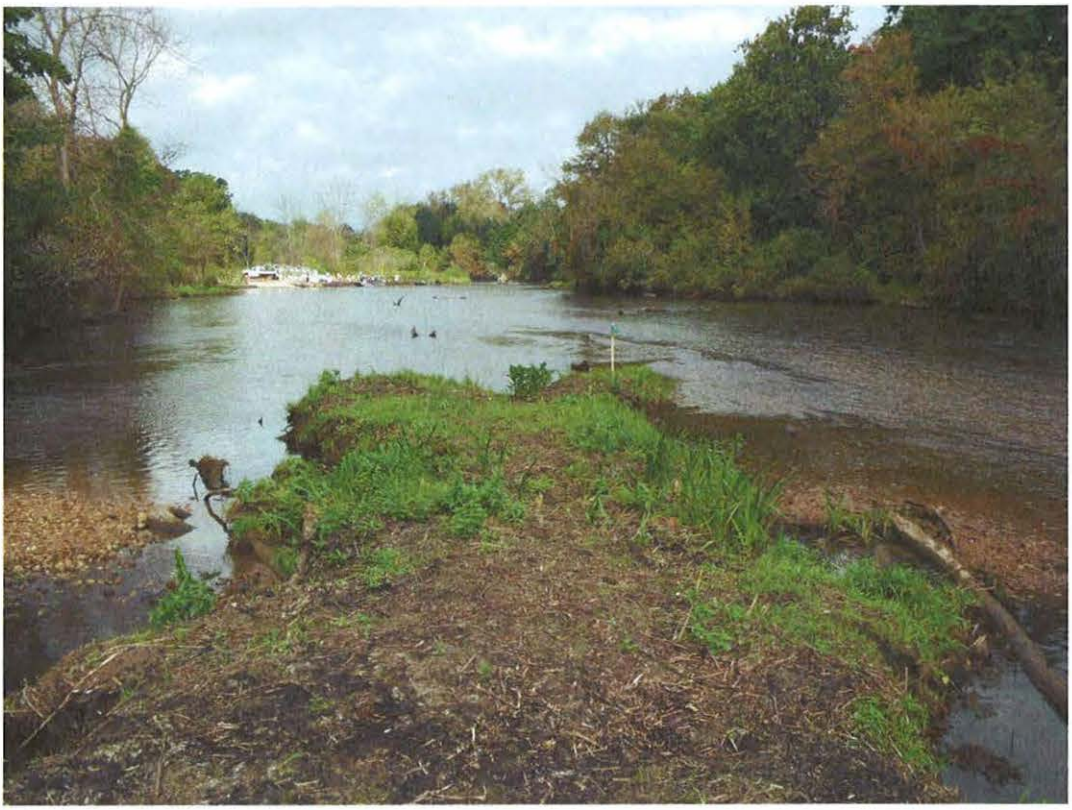


Photo 0240 – Looking west at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.

Field Photo Log – Segment MP 7.50



Photo 0241 – Looking southwest at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0243 – Looking east at Island shoreline. Near EPA-C-0175, SCC2-20, & SCC2-21.



Photo 0244 – Looking north at right descending bank. Near EPA-C-0177.



Photo 0245– Looking northeast at right descending bank. Near EPA-C-0177.



Photo 0246 – Looking northeast at right descending bank. Near EPA-C-0177.



Photo 0247 – Looking north at right descending bank. Near EPA-C-0177.



Photo 0248 – Looking northwest at right descending bank. Near EPA-C-0177.



Photo 0249– Looking north at right descending bank. Near EPA-C-0174.



Photo 0250 – Looking northeast at right descending bank. Near EPA-C-0174.

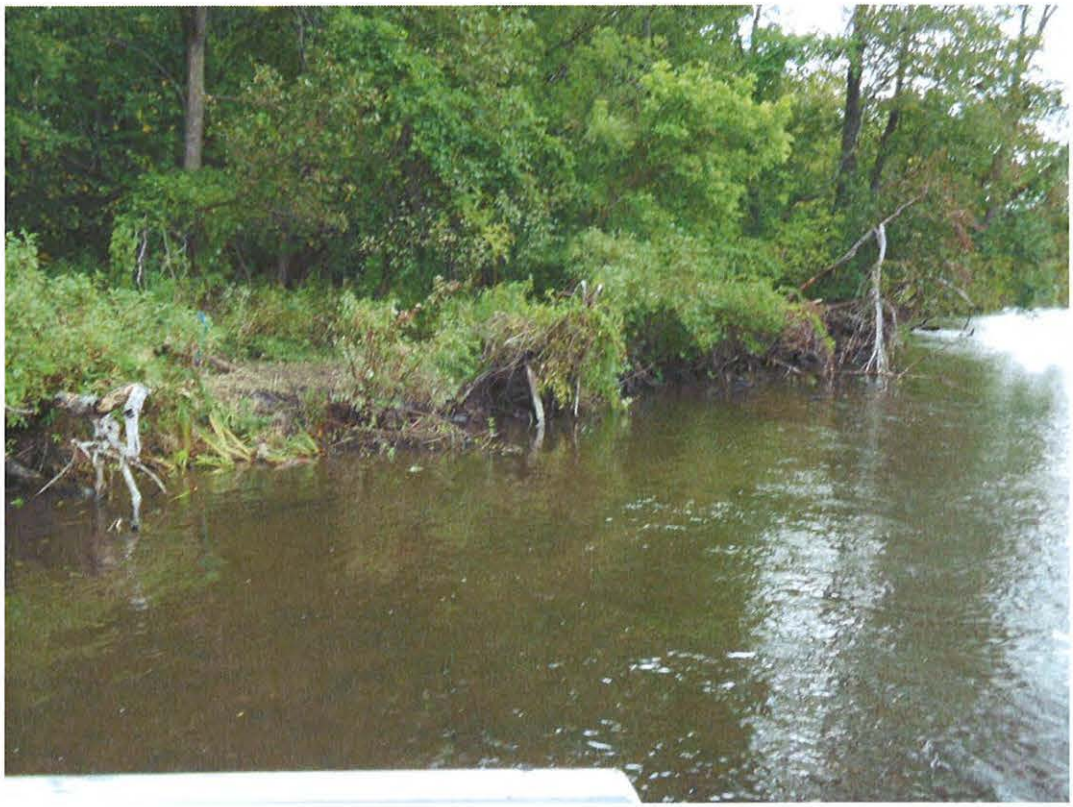


Photo 0251 – Looking northeast at right descending bank. Near EPA-C-0174.



Photo 0252 – Looking north at right descending bank. Near EPA-C-0174.



Photo 0253 – Looking northwest at right descending bank. Near EPA-C-0174.



Photo 0254 – Looking north at right descending bank. Near SCC2-9.

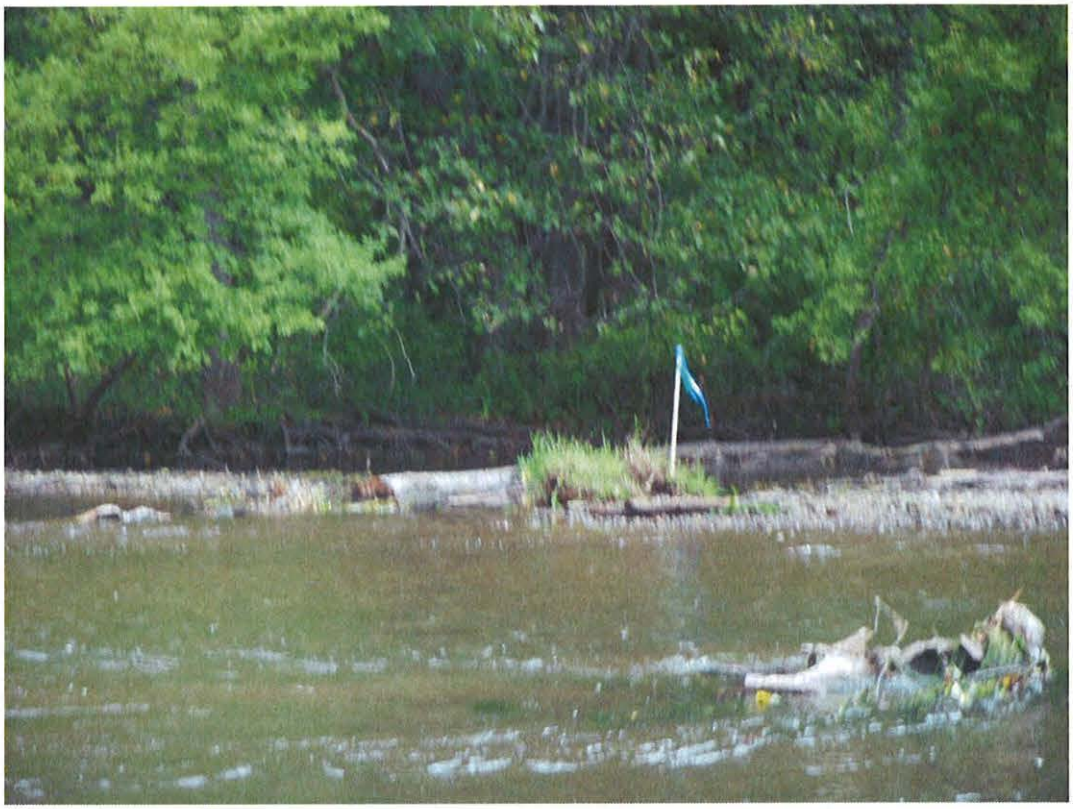


Photo 0255 – Looking north at right descending bank. Near SCC2-9.



Photo 0256 – Looking north at right descending bank. Near SCC2-9.



Photo 0257 – Looking north at right descending bank. Near SCC2-9.



Photo 0258 – Looking north at right descending bank. Near SCC2-9.

Field Photo Log – Segment MP 7.50



Photo 0259 – Looking east at right descending bank. Near SCC2-9.



Photo 0264 – Looking east at right descending bank. Near SCC2-9.

Field Photo Log – Segment MP 7.50



Photo 0260 – Looking north at right descending bank. Near EPA-C-0115.



Photo 0261 – Looking northwest at right descending bank. Near EPA-C-0115.



Photo 0262 – Looking northeast at right descending bank. Near EPA-C-0115.



Photo 0263 – Looking northeast at right descending bank. Near EPA-C-0115.

Field Photo Log – Segment MP 7.50



Photo 0265 – Looking west at left descending bank. Near EPA-C-0007.



Photo 0266 – Looking south at left descending bank. Near EPA-C-0007.

Field Photo Log – Segment MP 7.50



Photo 0267 – Looking east at left descending bank. Near EPA-C-0007.



Photo 0268 – Looking north at left descending bank. Near EPA-C-0007.

Field Photo Log – Segment MP 7.50



Photo 0269 – Looking north at left descending bank. Near EPA-C-0007.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 7.75 – MP 7.50 to 7.75

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 7.75 had light oiling including tar on vegetation, sporadic patches of tar, and tar balls on the left descending bank; and light oiling including oiled woody debris and overhanging limbs on the right descending bank. The overbank areas contained no oiling requiring clean-up. An island was present with some oiling and a band of stain around the island. The overbank areas on the island contained light oiling. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 7.75 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact.
- Removal of oiled debris
- Removal of overhanging limbs
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled logs in river on left and right descending bank near MP 7.75
- Oiled rocks and cobbles on the left descending bank near EPA-C-0008 and right descending bank near SCC2-8 and MP7.75
- Oiled trees on left and right descending banks
- Oiled soil on island and along bank, with required operation and maintenance activities. Operation and maintenance activities will consist of containment and absorbent booming strategies as required

Segment 7.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

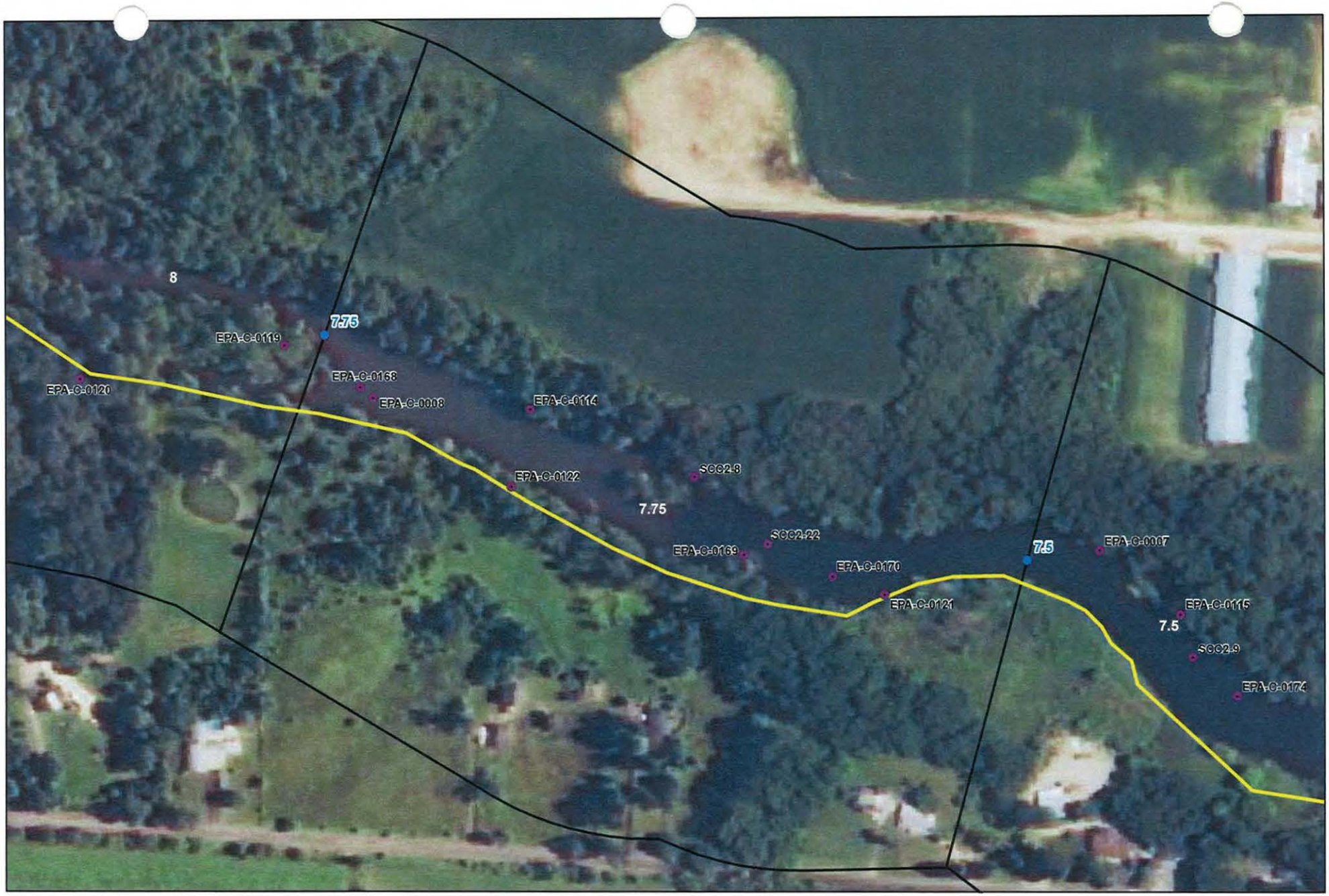
Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS									
	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 7.50-7.75 Left Bank While Looking Downstream									
SCC2-22	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	Log jam. Low impact. Possible access off private property.		
EPA-C-0170	Unknown	SCAT-T2 8/172010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0122	Unknown	SCAT-T2 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0008	Unknown	SCAT-T1 8/15/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0168	Unknown	SCAT-T2 8/172010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0170	Main Channel	SCAT-T2 8/172010				•	At boat launch 7.5. Overhanging vegetation cut in this zone. Some stemmed woody debris.		
EPA-C-0121 (Zone A)	Overbank	SCAT-T1 8/21/2010			•		Tar on vegetation, manual clean up, removal with rake		
EPA-C-0121 (Zone B)	Shoreline	SCAT-T1 8/21/2010					Deep sediment in bog, sheen on surface. Recommend to leave alone.		
EPA-C-0121 (Zone C)	Overbank	SCAT-T1 8/21/2010			•		Sporadic patches of tar, rake and remove.		
EPA-C-0121 (Zone D)	Shoreline	SCAT-T1 8/21/2010					Staining along shoreline, leave alone.		
EPA-C-0121 (Zone E)	Shoreine	SCAT-T1 8/21/2010					Tar balls and coating. Scrape off and remove.		





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 7.5 - 7.75
Left Bank While Looking Downstream

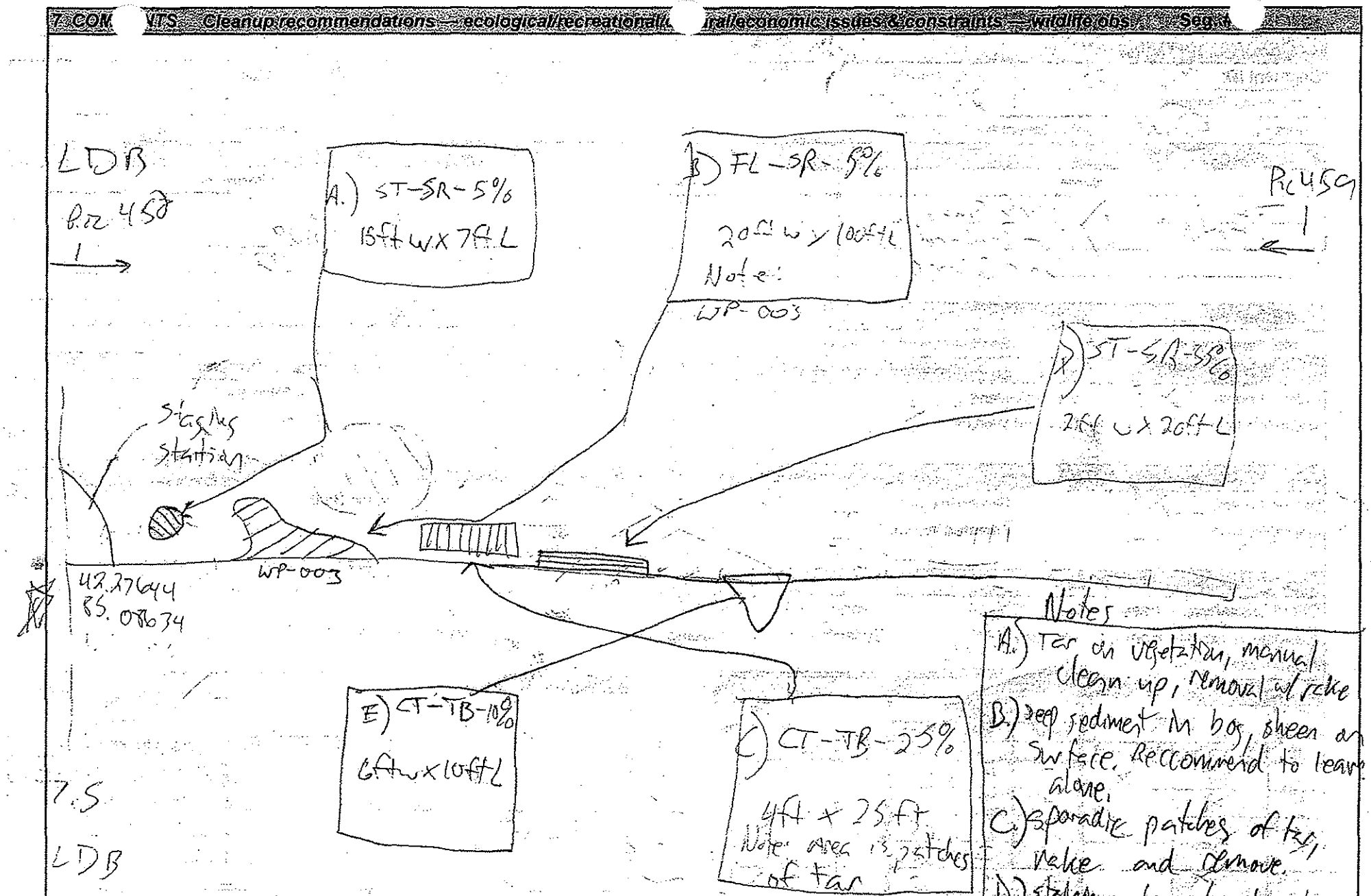
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

7. COMMENTS: Cleanup recommendations — ecological/recreational/... trail/economic issues & constraints — wildlife obs:... Segment



Sketch Y/N Photos Y/N (# _____) Video Y/N

Division C: Mile Marker 7.50 - 7.75 Left Bank looking downstream

SOS form

OPERATIONS CLEANUP RECOMMENDATIONS									
	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 7.50-7.75 Island									
EPA-C-0169	Island	SCAT-T2 8/172010					Small island with some oil on vegetation in spots.		
* (Zone A)	Shoreline and Overbank	SCAT-T1 8/21/2010			•		Surface residue with small amounts of tar, could be raked up and removed		
* (Zone B)	Shoreline and Overbank	SCAT-T1 8/21/2010			•		Entire east point of island is impacted, but has been cleaned well. Still small amounts of surface residue and tree banding. No recommendation for tree banding, but surface could be raked again and removed.		
* (Zone C)	Shoreline	SCAT-T1 8/21/2010					Tree banding, no recommended action.		
EPA-C-0122 (Zone A)	Shoreline and Overbank	SCAT-T1 8/21/10			•		There still some thick surface residue and tar that can be raked or shoveled and removed.		
EPA-C-0122 (Zone B)	Shoreline and Overbank	SCAT-T1 8/21/10		•			Major area of concern, pooled oil and tar that HAS to be removed. Area is marked by waypoint 004 and a pink flag		
EPA-C-0122 (Zone C)	Shoreline	SCAT-T1 8/21/10	•				Along the shoreline there is still some residue and coating. Tree banding should be left in place but surface residue could be low pressure wash.		





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 7.5 - 7.75
Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

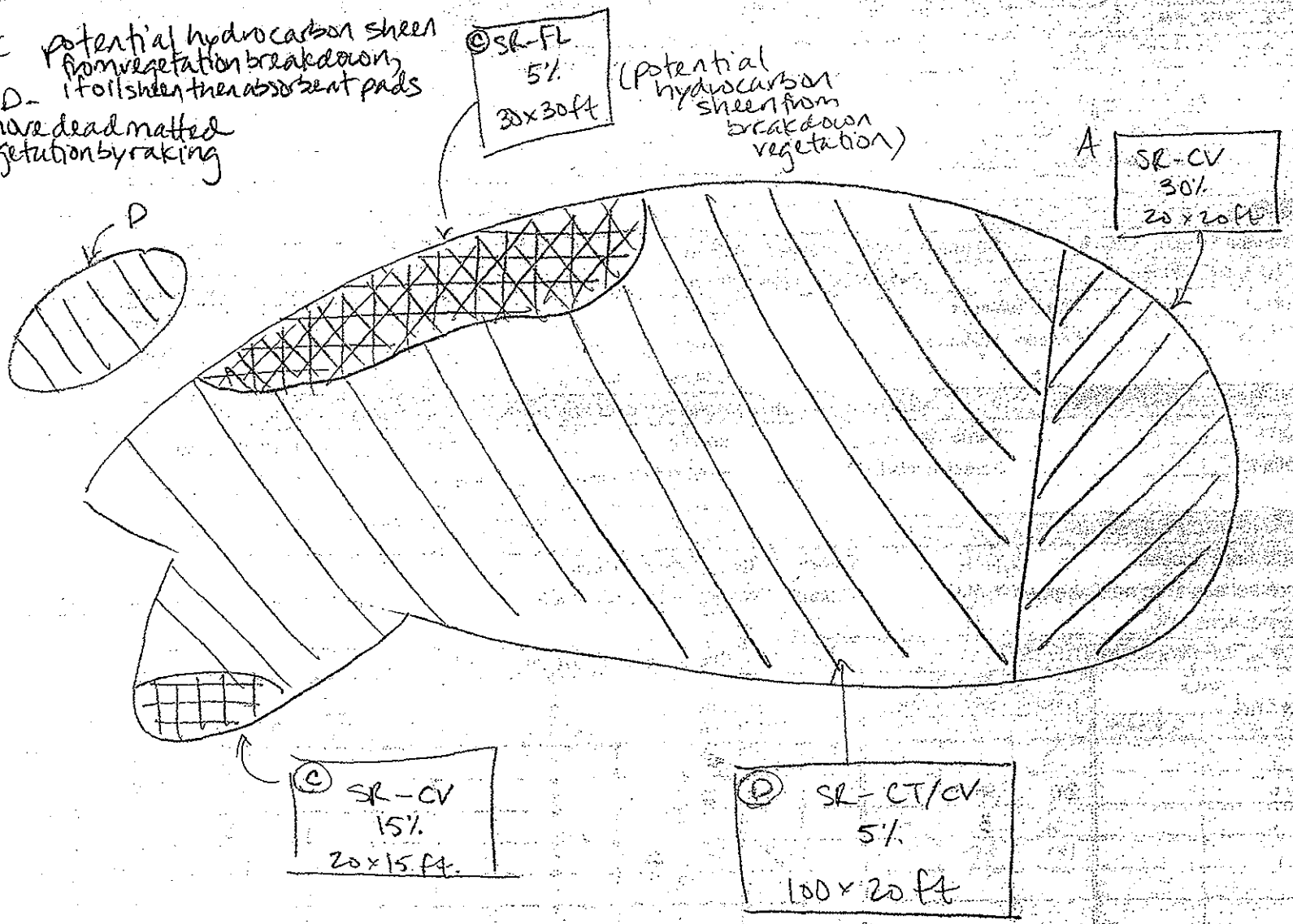
Coordinate System: NAD 1983 State Plane Michigan South Feet

Zone A – remove dead matted vegetation by raking

Zone B – "

Zone C potential hydrocarbon sheen from vegetation breakdown, 1 foil sheen then absorbent pads

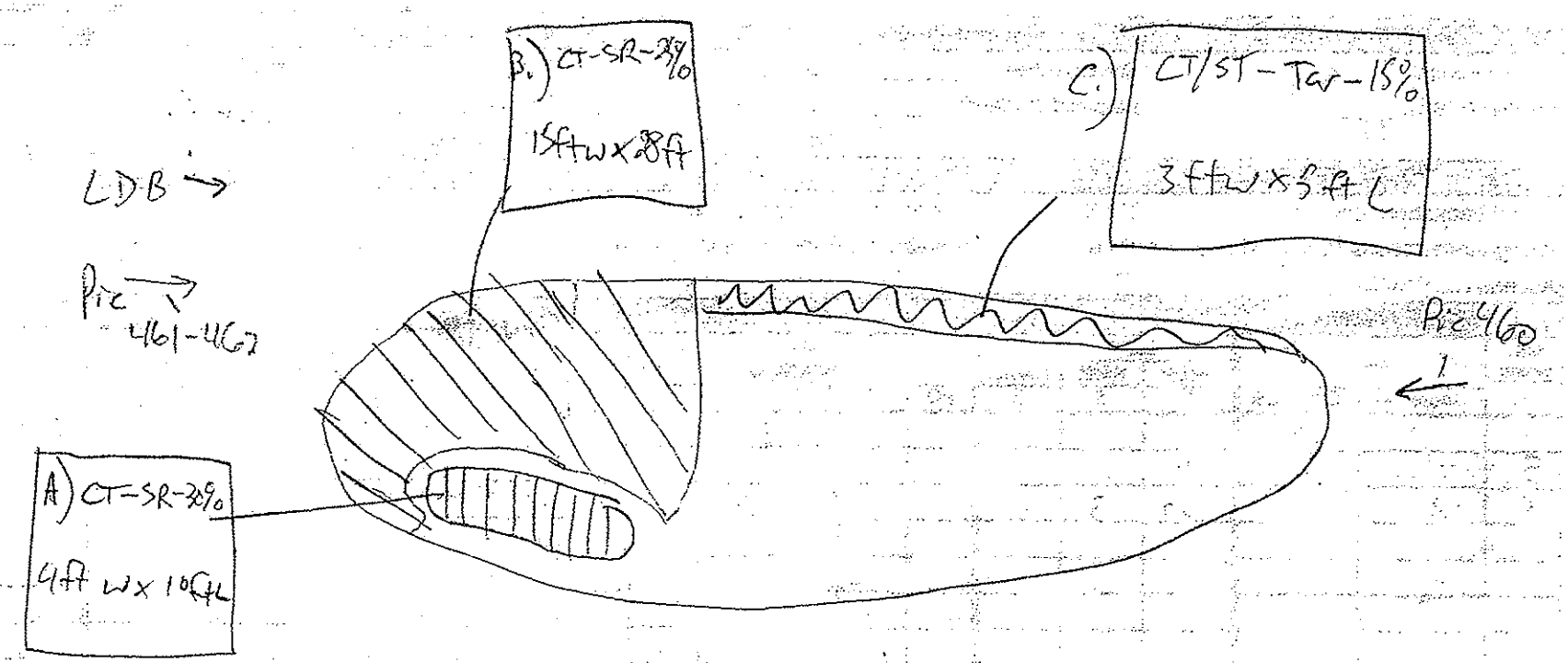
Zone D – remove dead matted vegetation by raking



A.) Surface residue with small amounts of tar, could be raked up and removed.

B.) Entire East point of Island B impacted, but has been cleaned well. Still small amounts of surface residue and tree banding. No recommendation for tree banding, but surface could be raked again and removed.

C.) Tree banding, No recommended action.



OPERATIONS CLEANUP RECOMMENDATIONS									
	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 7.50-7.75 Right Bank While Looking Downstream									
SCC2-8	Shoreline	Shoreline Assessment 8/6/2010	?		•	•			
EPA-C-0114 (Zone A)	Shoreline and Overbank	SCAT-T2 8/21/10					Sorbent pads for sheen.		
EPA-C-0114 (Zone B)	Shoreline	SCAT-T2 8/21/10			•		Cut overhanging vegetation that is oiled.		
EPA-C-0114 (Zone C)	Shoreline	SCAT-T2 8/21/10			•	•	Woody debris and tree limbs are oiled some > 4 inches, remove oiled sections and leave on oiled instead. Also some dead matted vegetation along shoreline to be removed close to 7.75 mile mark.		
EPA-C-0114 (Zone D)	Shoreline	SCAT-T2 8/21/10					Sorbent pads.		

OPERATIONS CLEANU. ECOMMENDATIONS									
	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
EPA-C-0122 (Zone D)	Shoreline	SCAT-T1 8/21/10					Band of stain around island, probably be left alone		
EPA-C-0122 (Zone E)	Shoreline	SCAT-T1 8/21/10	•				Tar and surface residue. Tree banding should be left in place but surface residue could be low pressure wash.		
EPA-C-0115 (Zone A)	Shoreline	SCAT-T2 8/21/10			•		Remove dead matted vegetation by raking		
EPA-C-0115 (Zone B)	Shoreline	SCAT-T2 8/21/10			•		Remove dead matted vegetation by raking		
EPA-C-0115 (Zone C)	Shoreline	SCAT-T2 8/21/10					Potential hydrocarbon sheen from vegetation breakdown, if oil sheen then absorbent pads		
EPA-C-0115 (Zone D)	Shoreline	SCAT-T2 8/21/10			•		Remove dead matted vegetation by raking		





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

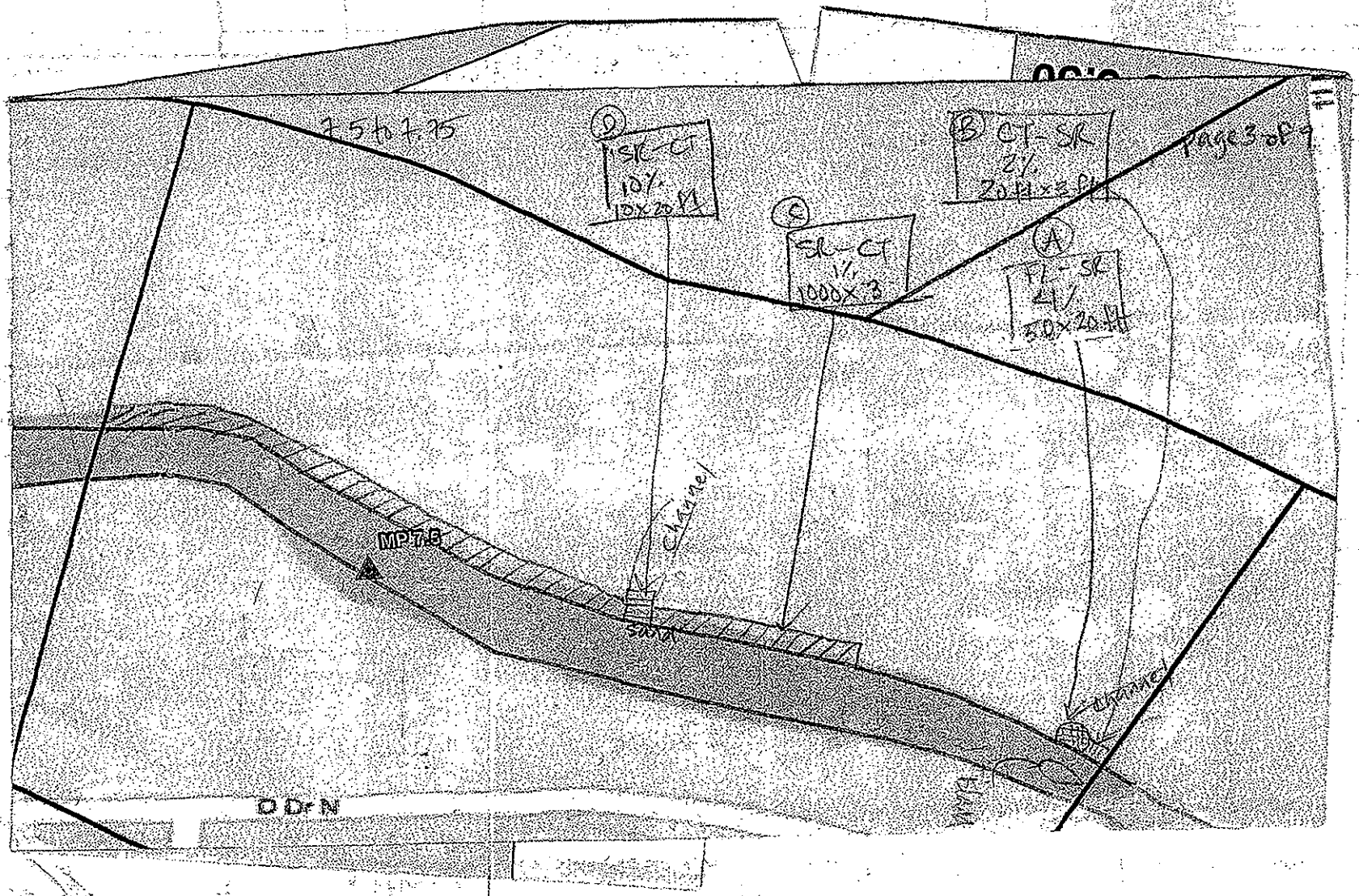
Division C: Mile Marker 7.5 - 7.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



Division C: Mile Marker 7.50 - 7.75 Right Bank looking downstream

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 09/06/10 **Time: AM / PM** 1700 HRS

Operations Division: C **Segment ID: From** 7.5 **Start MP to End MP** 7.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/ CLOUD.

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9/3/2010 **Time: AM (PM)** 12:30

Operations Division: C **Segment ID: From** 7.50 **Start MP to End MP** 7.75 **Segment Length: 0.25 mile**

Bank: (LDB) / (RDB) ☒ **Island**

Weather: Sun/Cloud/Rain/Snow/ SUNNY 69° F

Field Inspection Team

EPA Inspector:

Enbridge Inspector: CHRISTOPHER HAUK

Division Supervisor(Contractor): Eric Hamptad

SCAT Reviewed – Description of Clean Up Required

- SHORELINE OILY VEGITATION REMOVAL
- ISLAND VEGITATION

Clean Up Performed – Description of Clean Up Complete

☒ **SCAT Requirements/Clean Up Complete**

- SHORELINE CLEARED - NO OILY VEGITATION, ALL DEBRIS REMOVED UNDER FOUR FEET
- FLUSH SHORE
- REMOVED DEBRIS

Punchlist Items Identified

☒ **Punchlist Items Complete** (add check on punchlist item when completed)

SHORE FLUSHED

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090610 **Time: AM / PM** 1430

Operations Division: C **Segment ID: From** 7.5 **Start MP to End MP** 7.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Chad Vyse CCV

Division Supervisor(Contractor): Arnold Phillips

SCAT Reviewed – Description of Clean Up Required

Reviewed all areas as indicated by SCAT. Corrective actions included flushing, debris removal and removal of herbaceous + woody vegetation.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work completed.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 7.50-7.75 Left Bank While Looking Downstream										
SCC2-22	Shoreline	Shoreline Assessmen t 8/6/2010	•		•	•	Log jam. Low impact. Possible access off private property.			(Y) / N
EPA-C-0170	Unknown	SCAT-T2 8/172010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-0122	Unknown	SCAT-T2 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-0008	Unknown	SCAT-T1 8/15/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-0168	Unknown	SCAT-T2 8/172010	Refer to Kalamazoo River/Enbridge Spill- Claanup Recommendation Methods							(Y) / N
EPA-C-0170	Main Channel	SCAT-T2 8/172010				•	At boat launch 7.5. Overhanging vegetation cut in this zone. Some stemmed woody debris.			(Y) / N
EPA-C-0121 (	Overbank	SCAT-T1 8/21/2010			•		Tar on vegetation, manual clean up, removal with rake			(Y) / N
EPA-C-0121 (	Shoreline	SCAT-T1 8/21/2010					Deep sediment in bog, sheen on surface. Recommend to leave alone.			(Y) / N
EPA-C-0121 (	Overbank	SCAT-T1 8/21/2010			•		Sporadic patches of tar, rake and remove.			(Y) / N
EPA-C-0121 (	Shoreline	SCAT-T1					Staining along shoreline.			(Y) / N
EPA-C-0121 (	Shoreine	SCAT-T1					Tar balls and coating.			(Y) / N

Printed Team Members Names: MIKE ZAMBETIS, Dana Strouse, WILLIAM BATES

Date: 9/6/10

Comments:

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 7.50-7.75 Right Bank While Looking Downstream										
SCC2-8	Shoreline	Shoreline Assessment 8/6/2010	?		•	•				(Y) N
EPA-C-0114	Shoreline and Overbank	SCAT-T2 8/21/10					Sorbent pads for sheen.			(Y) / N
EPA-C-0114	Shoreline	SCAT-T2 8/21/10			•		Cut overhanging vegetation that is oiled.			(Y) / N
EPA-C-0114	Shoreline	SCAT-T2 8/21/10			•	•	Woody debris and tree limbs are oiled some > 4 inches, remove oiled sections and leave on oiled instead. Also some dead matted vegetation along shoreline to be removed close to 7.75 mile mark.			(Y) / N
EPA-C-0114	Shoreline	SCAT-T2 8/21/10					Sorbent pads.			(Y) / N

Printed Team Members Names: Dana Strouse, William Bates, Mike Zambetis

Date: 9/6/10

Comments:

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 7.50-7.75 Island										
EPA-C-0169	Island	SCAT-T2 8/172010					Small island with some oil on vegetation in spots.			(Y) N
* (Zone A)	Shoreline and Overbank	SCAT-T1 8/21/2010			•		Surface residue with small amounts of tar, could be raked up and removed			(Y) N
* (Zone B)	Shoreline and Overbank	SCAT-T1 8/21/2010			•		Entire east point of island is impacted, but has been cleaned well. Still small amounts of surface residue and tree banding. No recommendation for tree banding, but surface could be raked again and removed.			(Y) N
* (Zone C)	Shoreline	SCAT-T1 8/21/2010					Tree banding, no recommended action.			(Y) N
EPA-C-0122 (	Shoreline and Overbank	SCAT-T1 8/21/10			•		There still some thick surface residue and tar that can be raked or shoveled and removed.			(Y) N
EPA-C-0122	Shoreline and Overbank	SCAT-T1 8/21/10		•			~~Major area of concern~~, pooled oil and tar that HAS to be removed. Area is marked by waypoint 004 and a pink flag			(Y) N

POINT ACTUALLY ON LEFT DOWNSTREAM BANK

Printed Team Members Names: MIKE ZAMBETTIS, WILLIAM DATES, Dana Strouse

Date: 9/6/10

Comments:

1.) NUMEROUS COATED LIVE TREES REMAIN BUT SCAT RECOMMENDATIONS ALL SUCCESSFULLY COMPLETED.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 7.50 **to MP** 7.75 **Segment Length: 0.25 mile**

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley 06-Sept-2010 (date) Enbridge

Signature 9/6/10 (date) EPA

4. **SCAT Reassessment**

Signature Michael A. Zanetis 9/6/10 (date) Enbridge

Signature William J Bates 9/6/10 (date) EPA

Signature Dana Strouse 9/6/10 (date) MDNRE

5. **EPA**

Signature 9/8/10 (date) EPA Division Supervisor

Red tape on free COB. Unsure why it's there, but this tape is unrelated to SCAT or to operations CW

Appendix E
Photos



Photo 0138 – Looking southwest at left descending bank. Near EPA-C-9121 & EPA-C-0170.



Photo 0143 – Looking southeast at left descending bank. Near SCC2-22.



Photo 0147 – Looking north at right descending bank. Near EPA-C-0114.



Photo 0150 – Looking north at right descending bank. Near SCC2-8.



Photo 0153 – Looking southeast at left descending bank. Near EPA-C-0008 & EPA-C-0168.



Photo 0161 – Looking west at left descending bank. Near EPA-C-0008 & EPA-C-0168.

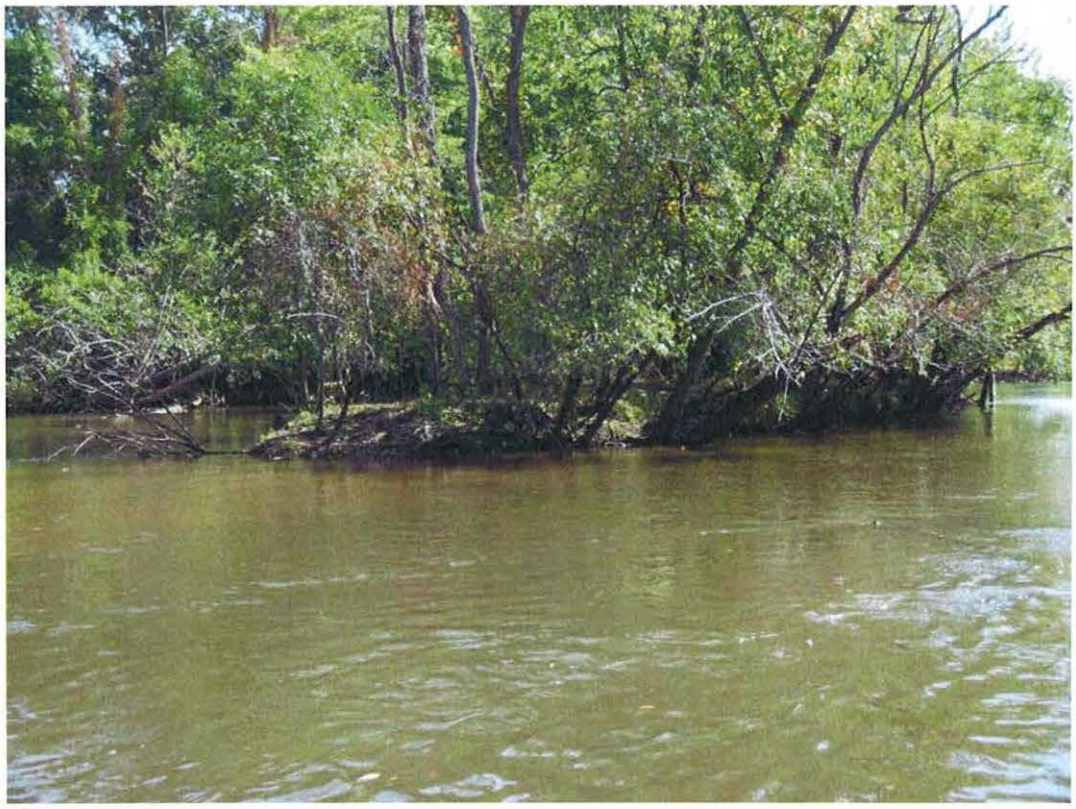


Photo 0162 – Looking northeast at island shoreline. Near EPA-C-0169.



Photo 0166 – Looking north at island shoreline. Near EPA-C-0169.

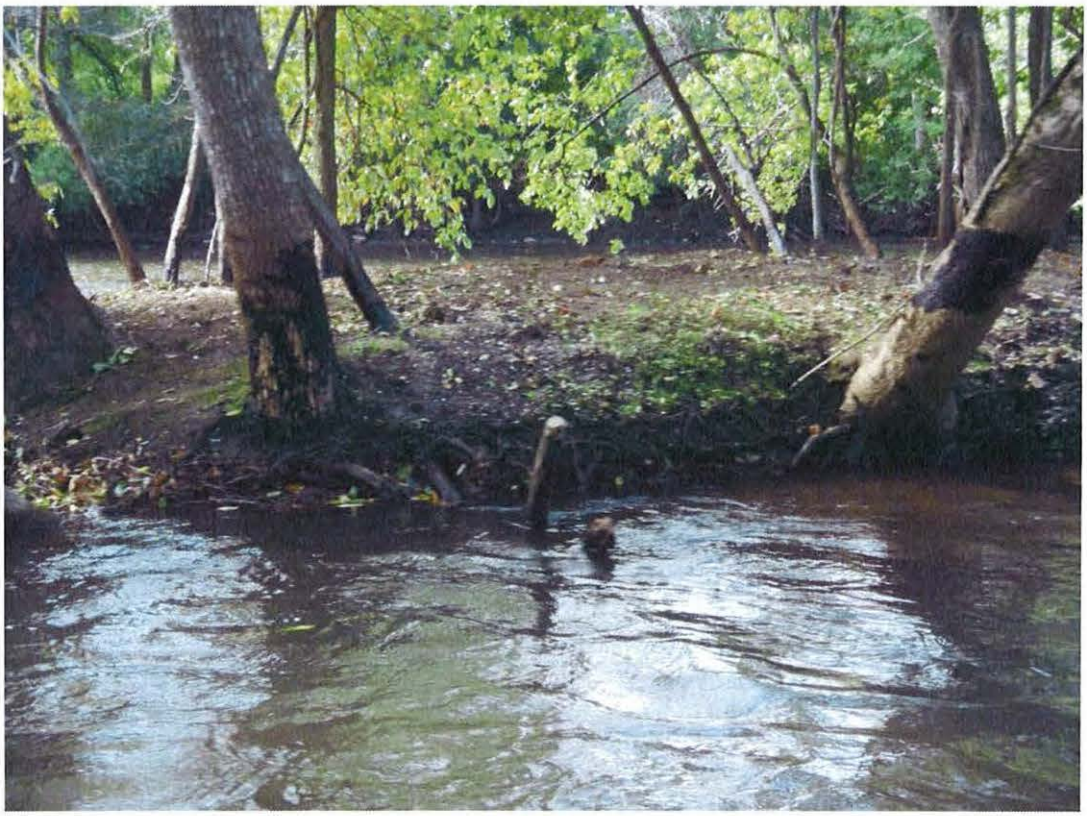


Photo 0169 – Looking south at island shoreline. Near EPA-C-0169.



Photo 0173 – Looking south at island shoreline. Near EPA-C-0169.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 8.00 – MP 7.75 to 8.00

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 8.00 had light oiling on the left descending bank and light oiling on the right descending bank. The overbank areas along the Segment contained oiled debris and vegetation, and oiled conditions were observed on islands. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 8.00 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris
- Removal of overhanging vegetation

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along left descending bank near EPA-C-0120
- Oiled woody vegetation along left and right descending banks and island in the central half of the Segment
- Tar cover on cut logs on island
- Oiled soil on island

Segment 8.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS									
	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 7.75-8.00 Left Bank While Looking Downstream									
SCC2-23	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	Island floodplain - high impact.		
EPA-C-0119	Unknown	SCAT-T2 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0120	Unknown	SCAT-T2 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0167	Main Channel	SCAT-T2 8/172010					Boom deployment. Newer catch boom near shoreline ~ 100' apart in this zone.		
EPA-C-0112	Unknown	SCAT-T1 8/21/2010							





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 7.75 - 8.0
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

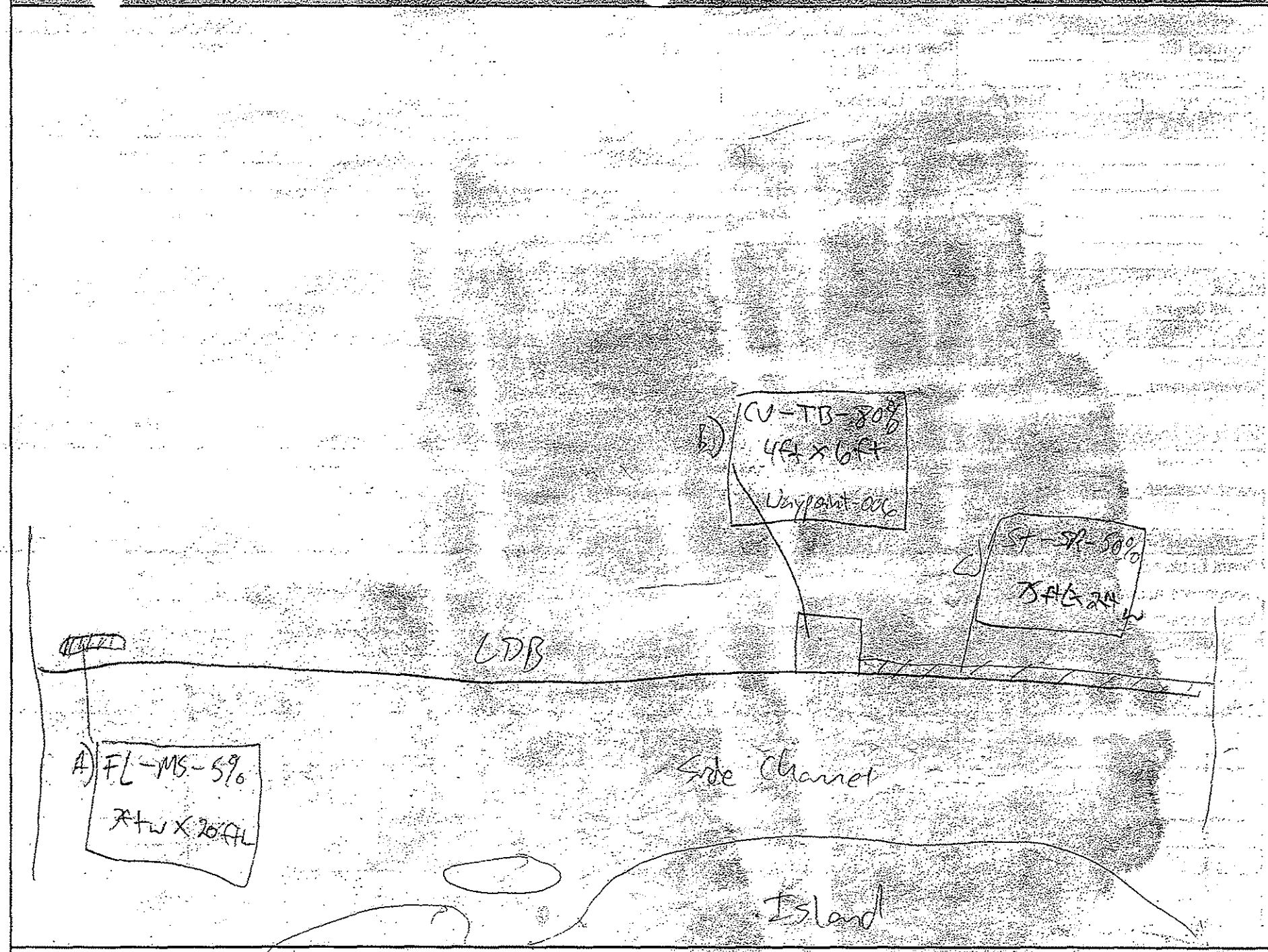
0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

7 COMM | S: Cleanup recommendations — ecological/recreational/cu | l/economic issues & constraints — wildlife/obs | Seg #



Sketch Y/N . Photos Y/N (#_____) Video Y/N

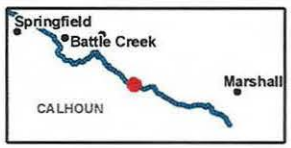
Division C: Mile Marker 7.75 - 8.0 Left Bank looking downstream

SOS form

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 7.75-8.00 Island									
EPA-C-0112 (Zone A)	Shoreline and Overbank	SCAT-T2 8/21/10			•		Rake dead, matted oiled vegetation.		
EPA-C-0112 (Zone B)	Shoreline and Overbank	SCAT-T2 8/21/10					Sorbent pads.		
EPA-C-0112 (Zone C)	Shoreline	SCAT-T2 8/21/10			•		Cut roots closer.		
EPA-C-0112 (Zone D)	Shoreline and Overbank	SCAT-T2 8/21/10				•	Remove, cut debris.		





River Quarter Miles
Oper. Focus Areas
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 7.75 - 8.0
Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

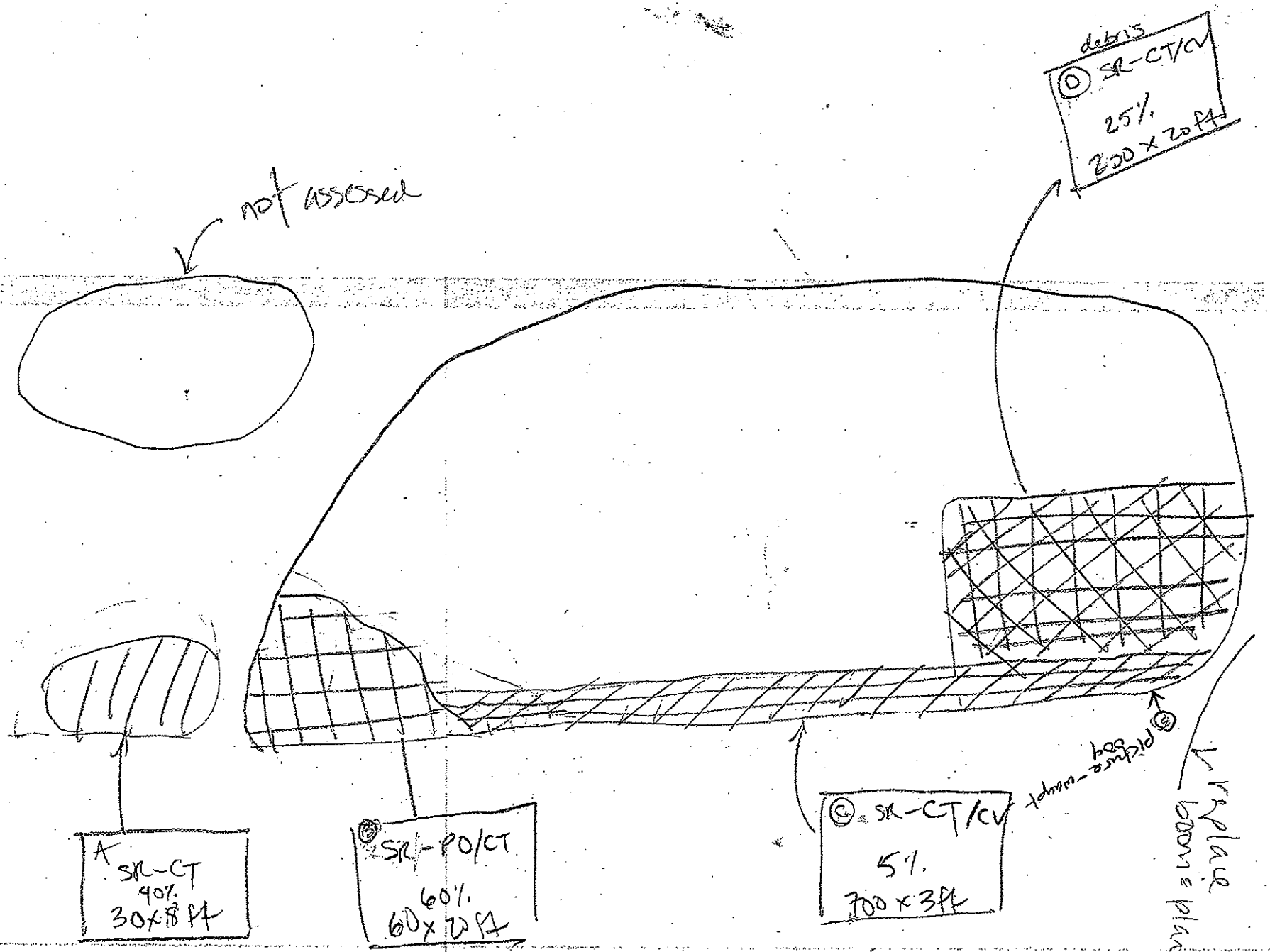
0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Island 7.75

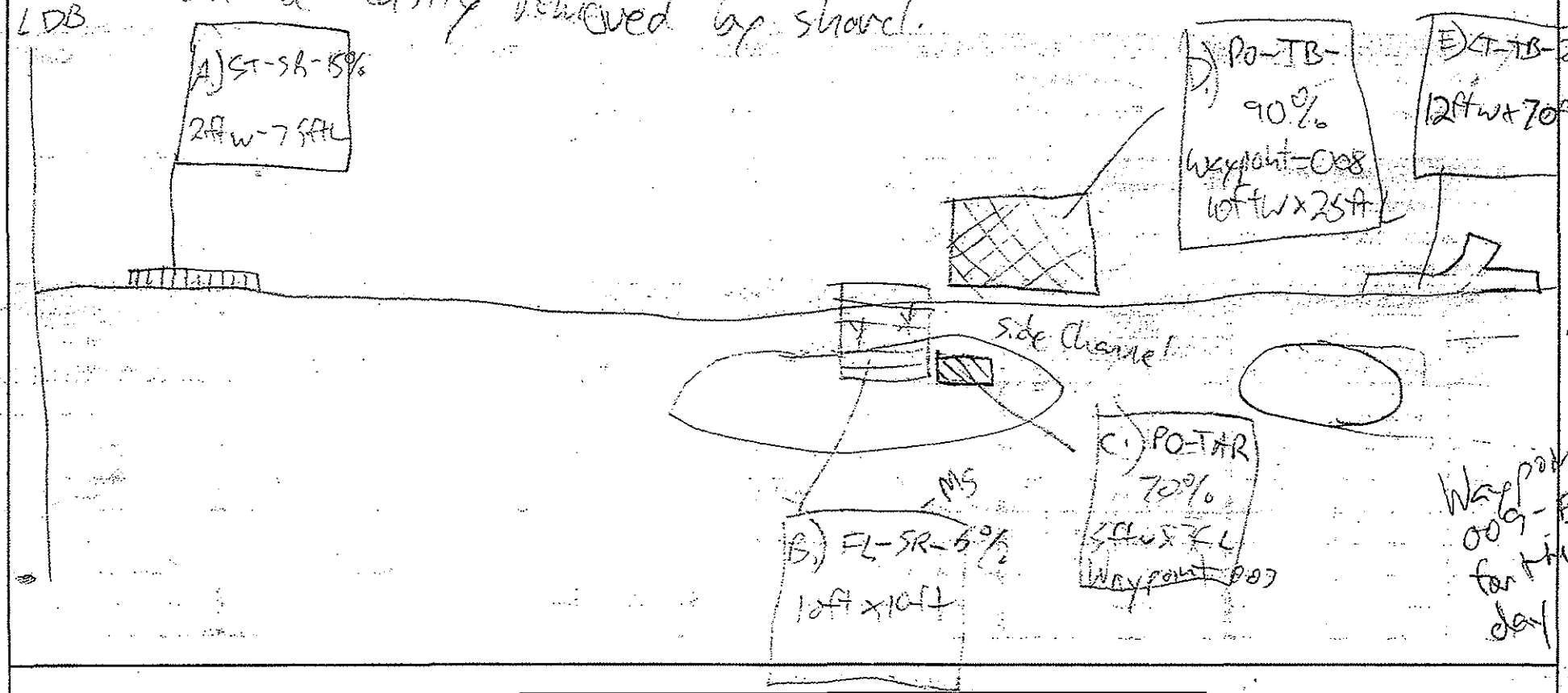

not assessed
debris
D SR-CT/CV
25%
200 x 20 ft
A SR-CT
40%
30x18 ft
B SR-PO/CT
60%
60x20 ft
C SR-CT/CV
5%
700 x 3 ft
replace boom = planket

A.) stash along shorelines, leave be, no recommended clean-up.

B.) This area is a snag island the island, the snag has accumulated a substantial amount of sheen that could be absorbed by pads or pom poms.

C) and D)) are two seperate patches of pooled oil that is actually on the soil surface, should be vacced/shoveled out.

E.) Sporadic patches of tar along shoreline and about 10 ft on overbank. Can be easily removed by shovel.



OPERATIONS CLEANUP RECOMMENDATIONS									
	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 7.75-8.00 Right Bank While Looking Downstream									
EPA-C-0111	Unknown	SCAT-T1 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-0113	Unknown	SCAT-T1 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods						
EPA-C-111 (Zone A)	Shoreline	SCAT-T2 8/21/10			•		Remove heavily oiled sections of tree limB. Replace on-oiled sections in river.		
EPA-C-111 (Zone B)	Overbank	SCAT-T2 8/21/10					Sorbent pads.		
EPA-C-111 (Zone C)	Overbank	SCAT-T2 8/21/10			•		Remove vegetation that is oiled.		





River Quarter Miles
Shoreline Cleanup Locations
Quarter Mile Segment

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 7.75 - 8.0
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

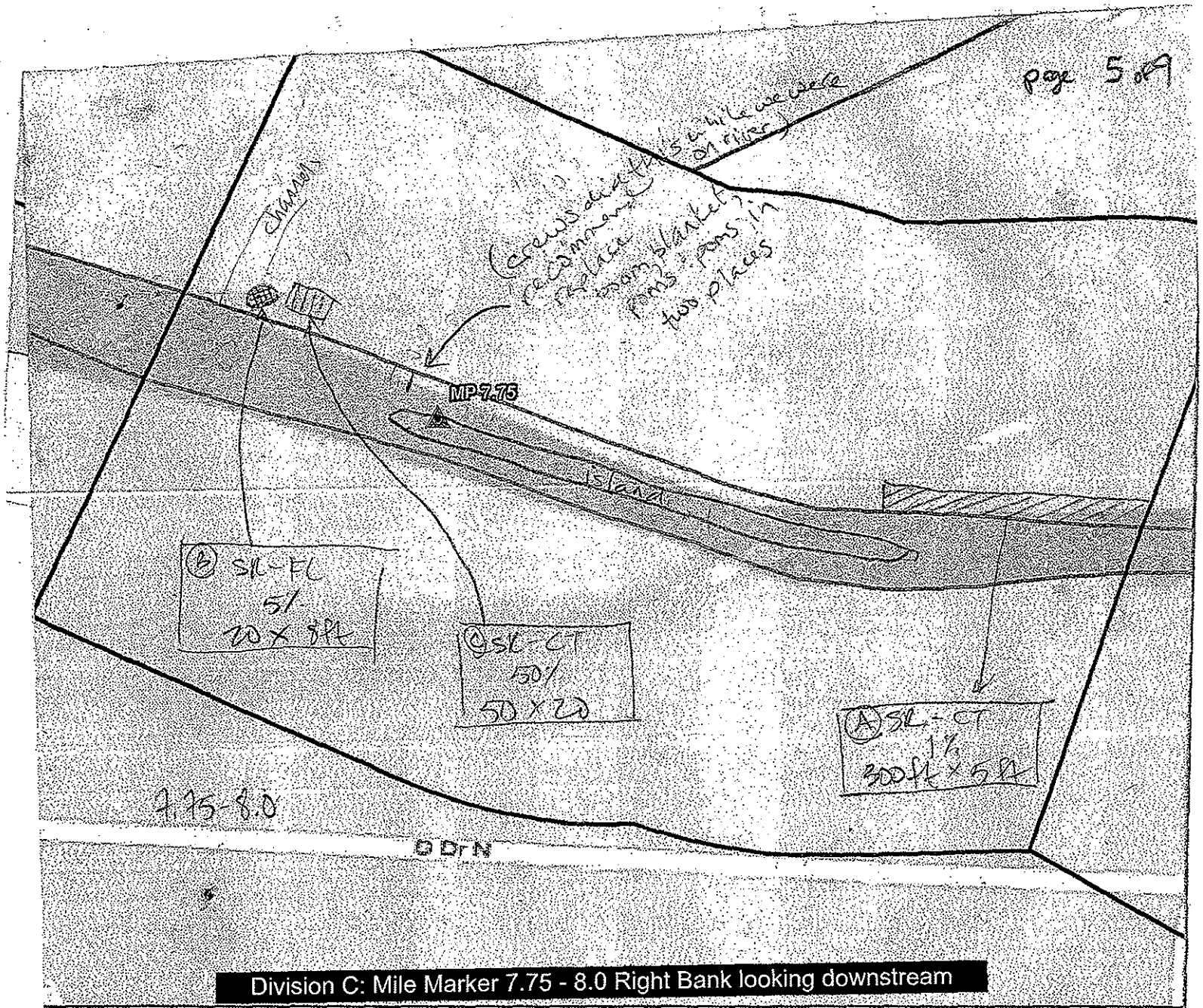
0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Division C: Mile Marker 7.75 - 8.0 Right Bank looking downstream

Prepared for: U.S. EPA REGION V Contract No.: EP-S5-06-04 TDD: S05-0005-1007-030 DCN: 1154-4D-AHMS	**FOR OFFICIAL USE ONLY**	Prepared by: WESTON SOLUTIONS, INC. 2501 Jolly Road, Suite 100 Okemos, MI	DIVISION C - MILE POST 7.75 (ST MARSHALL OIL ER MARSHALL, KALAMAZOO AND (CREATED: AUGUST 20, 2010

0082011X17_STREETS.mxd, 20-Aug-10 22:38, Dell

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/6/10 **Time: AM / PM** 1747

Operations Division: C **Segment ID: From** 7.75 **Start MP to End MP** 8.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island** **Overbank:** LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: JOE MANELLA

Division Supervisor(Contractor):

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090710 Time: AM / PM 1000 1000

Operations Division: C Segment ID: From 7.75 Start MP to End MP 8 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): Arnold Phillips

SCAT Reviewed – Description of Clean Up Required

Reviewed 17 items outlined by SCAT team
Corrective action needed were veg removal, debris removal, and flushing

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work completed as per SCAT requirements

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 7.75-8.00 Left Bank While Looking Downstream										
SCC2-23	Shoreline	Shoreline Assessment 8/6/2010	•		•		Island floodplain - high impact.			(Y) / N
EPA-C-0119	Unknown	SCAT-T2 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-0120	Unknown	SCAT-T2 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-0167	Main Channel	SCAT-T2 8/172010					Boom deployment. Newer catch boom near shoreline ~ 100' apart in this zone.			(Y) / N
EPA-C-0112	Unknown	SCAT-T1 8/21/2010								(Y) / N

Printed Team Member Names: Ernie Sartwpato (MDNRE), William J Bates, EPA, Ross Del Rosario (EPA), Pamela Rice, Enbridge / NRC

Date: 9/10/10

Comments: This is on the island

Island

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 7.75-8.00 Right Bank While Looking Downstream										
EPA-C-0111	Unknown	SCAT-T1 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-0113	Unknown	SCAT-T1 8/21/2010	Refer to Kalamazoo River/Enbridge Spill- Cleanup Recommendation Methods							(Y) / N
EPA-C-111 (Zone A)	Shoreline	SCAT-T2 8/21/10			•		Remove heavily oiled sections of tree limb. Replace on-oiled sections in river.			(Y) / N
EPA-C-111 (Zone B)	Overbank	SCAT-T2 8/21/10					Sorbent pads.			(Y) / N
EPA-C-111 (Zone C)	Overbank	SCAT-T2 8/21/10			•		Remove vegetation that is oiled.			(Y) / N

Printed Team Member Names: Bill Bates Erme Sarkipato, Mike Zamberlis
Date:
Comments: 9/11/10

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 7.75-8.00 Island										
EPA-C-0112 (Zone A)	Shoreline and Overbank	SCAT-T2 8/21/10			•		Rake dead, matted oiled vegetation.			(Y) / N
EPA-C-0112 (Zone B)	Shoreline and Overbank	SCAT-T2 8/21/10					Sorbent pads.			(Y) / N
EPA-C-0112 (Zone C)	Shoreline	SCAT-T2 8/21/10			•		Cut roots closer.			(Y) / N
EPA-C-0112 (Zone D)	Shoreline and Overbank	SCAT-T2 8/21/10				•	Remove, cut debris.			(Y) N

Printed Team Member Names: Ernie Sarkipato; MNRE; Pamela Rice, Enbridge/NRC; William Bates, EPA
Date: 9/10/10
Comments: Noted several piles of cut logs, some with tar cover
Ross Del Rosario (EPA)

Noted sparse sheen along shore on left (south) bank

Noted 20x20 area of Asphalt covered dirt with 70% coverage.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 7.75 **to MP** 8.00 **Segment Length: 0.25 mile**

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley (date) 09-Sept-2010 Enbridge

Signature Gary A. Andrew (date) 9.9.10 EPA
Gary A. Andrew

4. **SCAT Reassessment**

Signature Michael A. Zambetti (date) 9/11/10 Enbridge

Signature WILLIAM J BATES (date) 9/11/10 EPA

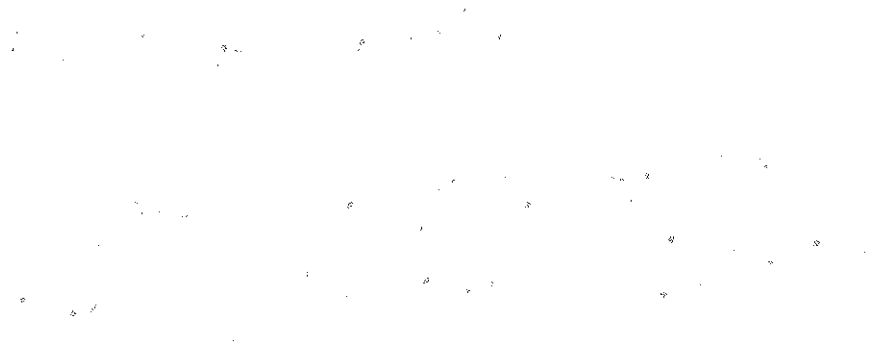
Signature ERNEST SAKIPATO (date) 9/11/10 MDNRE

5. **EPA**

Signature (date) Chris Wagner 9/18/10 EPA Division Supervisor

Hard boom being installed on LOB of island per direction of submerged oil

Appendix E
Photos



Field Photo Log – Segment MP 8.00



Photo 0303 – Looking east at left descending bank.



Photo 0304 – Looking southeast at left descending bank. Near SCC2-23.

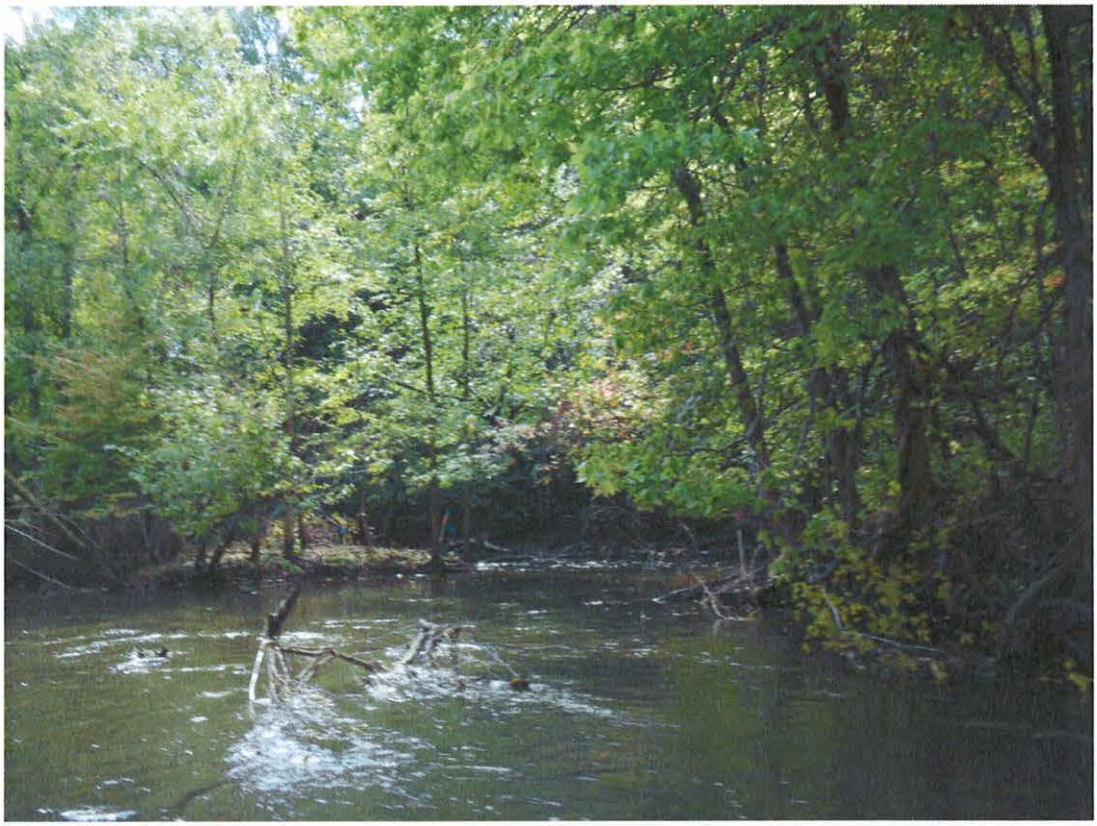


Photo 0305 – Looking south at island shoreline. Near EPA-C-0166.



Photo 0307 – Looking west at island shoreline. Near EPA-C-0167 and EPA-C-0112.



Photo 0308 – Looking west at left descending bank. Near EPA-C-0119 – Zone A.

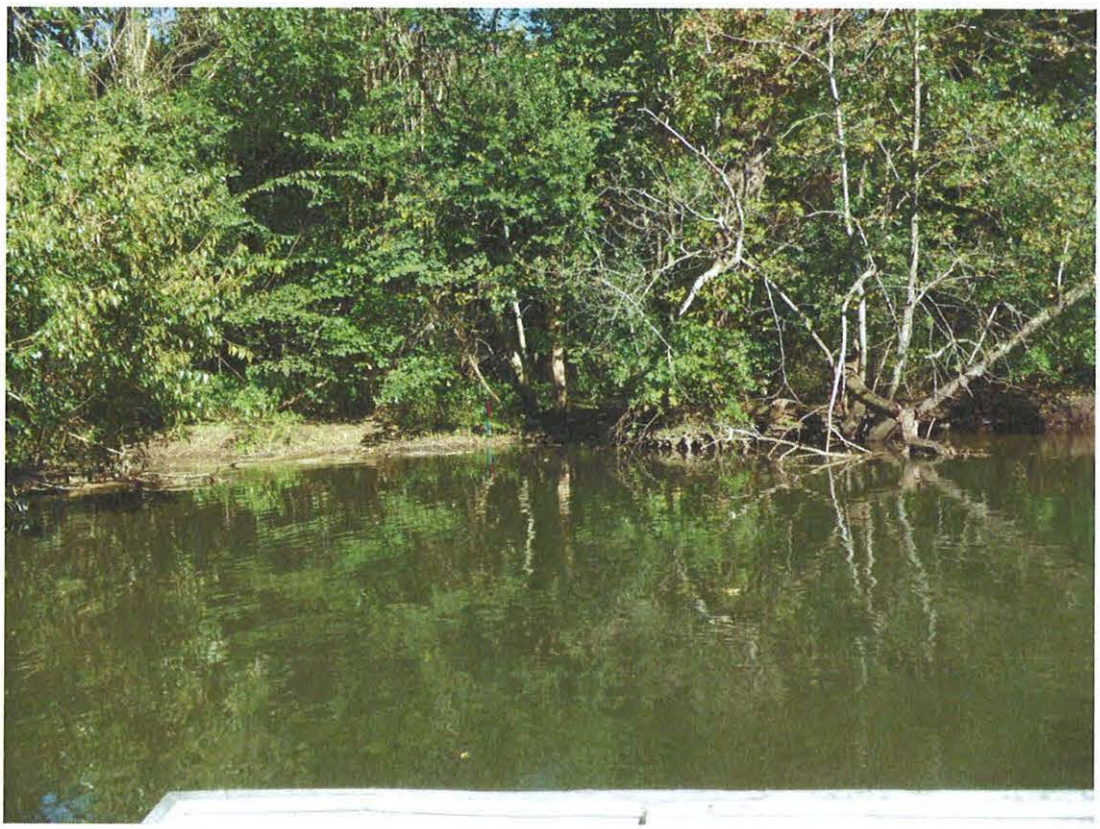


Photo 0320 – Looking northeast at right descending bank. Near EPA-C-0113.



Photo 0321 – Looking north at right descending bank. Near EPA-C-0111.



Photo 0322 – Looking southeast at right descending bank.



Photo 0323 – Looking southeast at left descending bank. Near EPA-C-0119 – Zone B.



Photo 0324 – Looking southwest at left descending bank. Near EPA-C-0119 – Zone C.



Photo 0325 Looking south at island. Near EPA-C-0112 - Zone B.



Photo 0326 – Looking southwest at island. Near EPA-C-0112 - Zone D.



Photo 0327 – Looking west at island. Near EPA-C-0112 - Zone E.



Photo 0328 – Looking west at island. Near EPA-C-0112 - Zone C.



Photo 0329 – Looking southeast at left descending bank. Near EPA-C-0119 Zone C.



Photo 0330 – Looking south at left descending bank. Near EPA-C-0119 - Zone A.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 8.25 – MP 8.0-8.25

Enbridge Energy

September 23, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 8.25 had light levels of oil staining on the upstream half of the left descending bank and moderate oil staining on the downstream half of the left descending bank. Pooled oil and sporadic patches of tar were observed throughout the shoreline and overbank. Specifically, SCAT teams noted patches of tarred soil mid-segment in the overbank area of the left descending bank and sheen which had accumulated at a snag behind an island just north of the shoreline. Two more islands are located further downstream off the right descending bank. Oiled sediment on the interior of the downstream island was observed toward the southeastern end, as well as several 1m x 1m and 2m x 1m pools of oil throughout the island's overbank. Surface residue was also noted on the island along its shoreline and within overbank areas. Along the shoreline of the right descending bank, a coat of surface oil residue was observed, along with pockets of pooled oil, oiled vegetation and debris, sheen, and sediment coated with an oily film mid-segment. Additionally, a coat of surface oil residue was observed on the right descending overbank towards the upstream mile marker.

Actions

The shoreline clean-up activities within Segment 8.25 consisted of the following:

- Vegetation removal, leaving roots intact and woody plants greater than 2 inches in diameter;
- Manual pooled oil removal;
- Removal of oiled debris;
- Removal of pooled oil through low pressure/high volume flushing and absorption methods.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Pooled oil remains in overbank areas and is to be monitored during Operations and Maintenance. SCAT teams recommend the use of pom-poms;
- Oiled woody vegetation remains along the shoreline of the left descending bank;
- Oiled sediment remains in the overbank of the left descending overbank near mile marker 8.5, as well as in the overbank of the island just north of the left descending overbank and the shorelines of both island off the right descending overbank;
- Oiled herbaceous vegetation remains in the overbank of the island just north of the left descending overbank;

- Oiled woody vegetation and oiled rock and cobble remain on the upstream portion of the right descending bank/overbank.

Segment 8.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

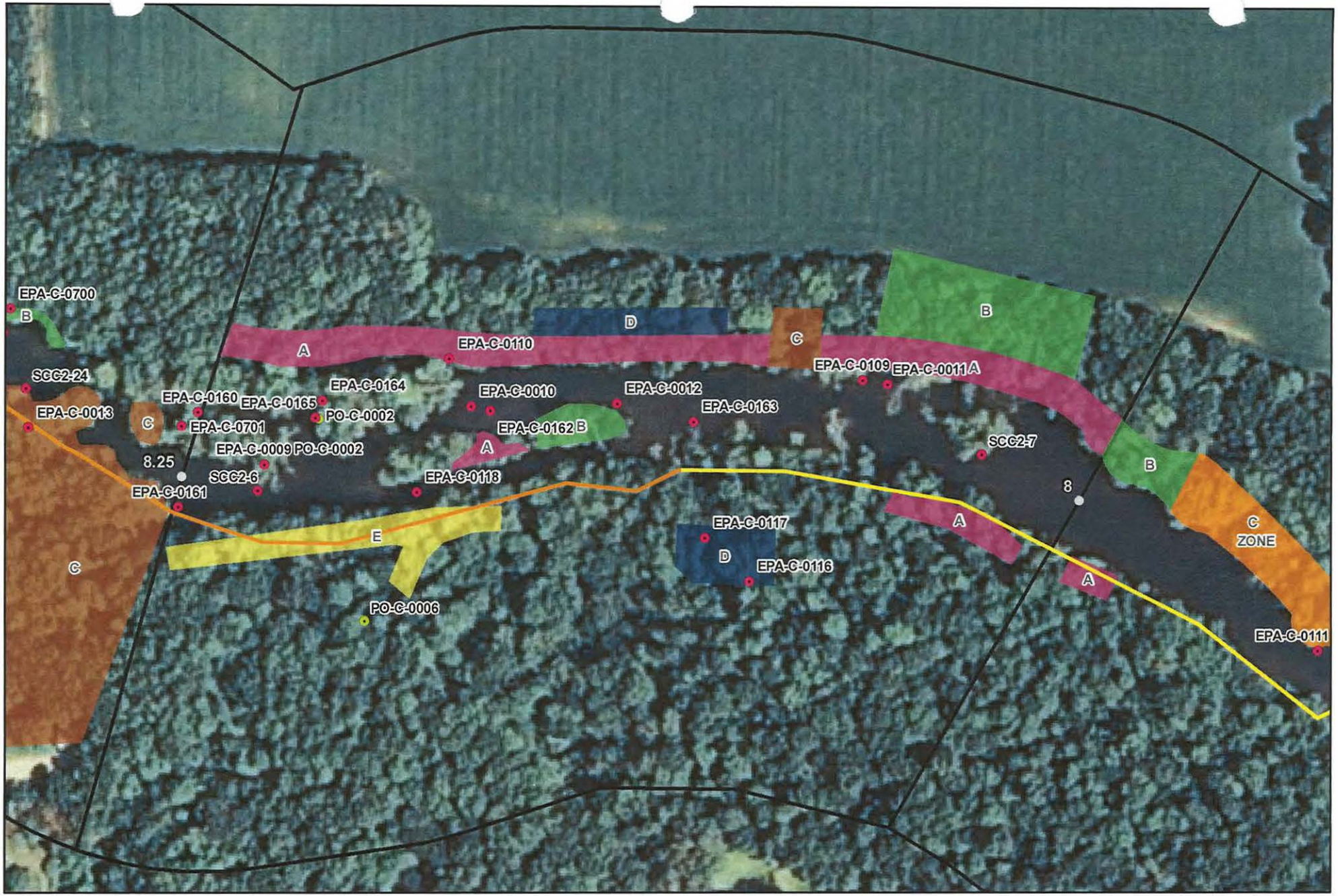
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 8-8.25 Left Bank While Looking Downstream									
PO-C-0006	Overbank	PooledOil Obriens 8/18/2010					Pool Oil Observed	42.27900	-85.09900
EPA-C-0117	Shoreine and Overbank	SCAT-T2 8/21/2010		•	•		Patch of pooled oil that is actually tar on the soil surface. Should be raked/shoveled out.	42.27933	-85.09722
EPA-C-0116	Shoreine and Overbank	SCAT-T1 8/21/2010		•	•		Patch of pooled oil that is actually tar on the soil surface. Should be raked/shoveled out.	42.27917	-85.09698
EPA-C-0161	Main Channel	SCAT-T2 8/17/2010		•			Pooled oil. Some large spots 10-20 gallons. From 0159 to 0160.	42.27943	-85.09998
EPA-C-0013	Main Channel	SCAT-T1 8/15/2010		•	•		Pooled oil approximately 100 feet back from river. Coating of vegetation all the way to the pool.	42.27973	-85.10077
EPA-C-0162	Main Channel	SCAT-T2 8/17/2010					Island on north side of LDB.	42.27982	-85.09836
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B BC C D E F G H NO OIL ZONE

Division C: Mile Marker 8-8.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

M.P. - 8.25 - LDB

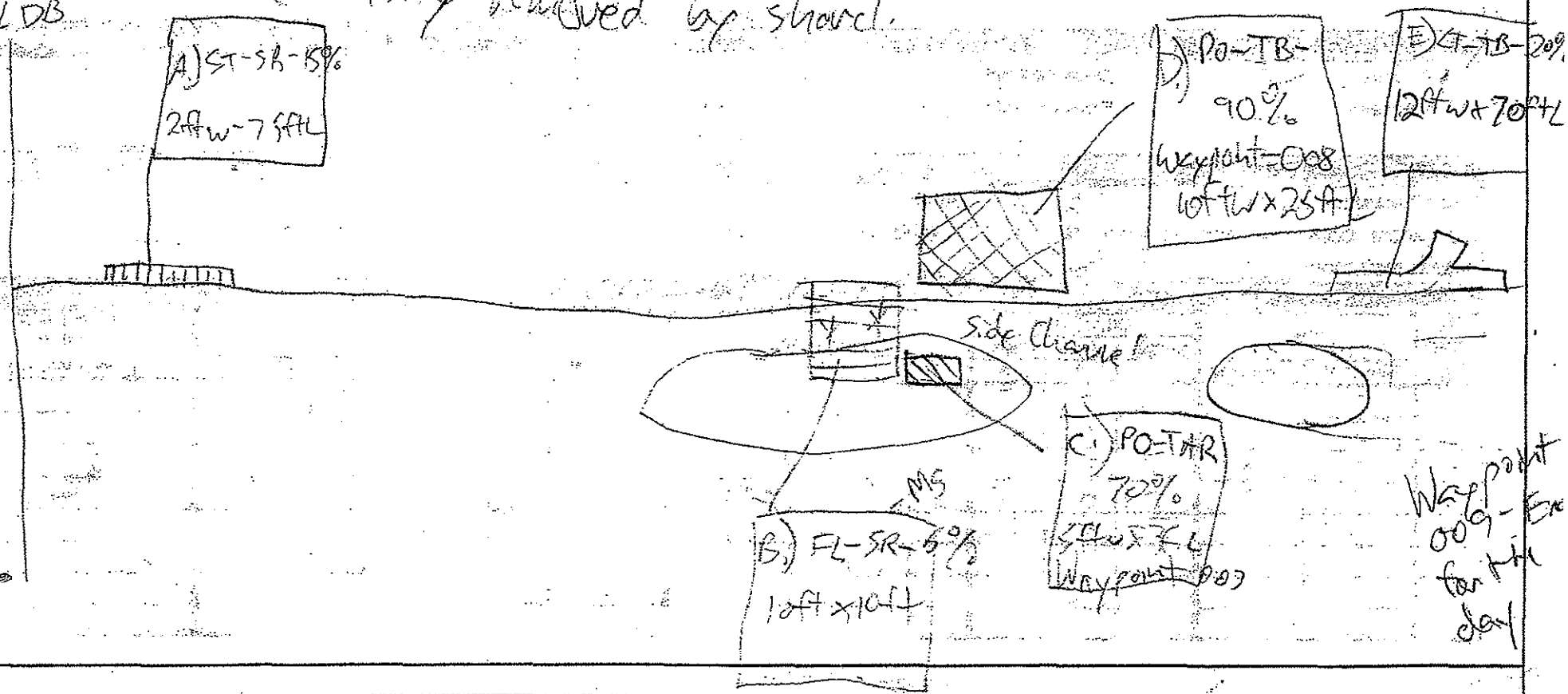
7 COM... S Cleanup recommendations — ecological/recreational/c... /economic issues & constraints — wildlife obs... Seg...

A.) stain along shorelines, leave be, no recommended clean-up.

B.) This area is a snag behind the island. The snag has accumulated a substantial amount of sheen that could be absorbed by pads or pompoms.

C) and D) are two seperate patches of pooled oil that is actually tar on the soil surface, should be racked/shoveled out.

E.) sporadic patches of tar along shoreline and about 10 ft on overbank. Can be easily removed by shovel.

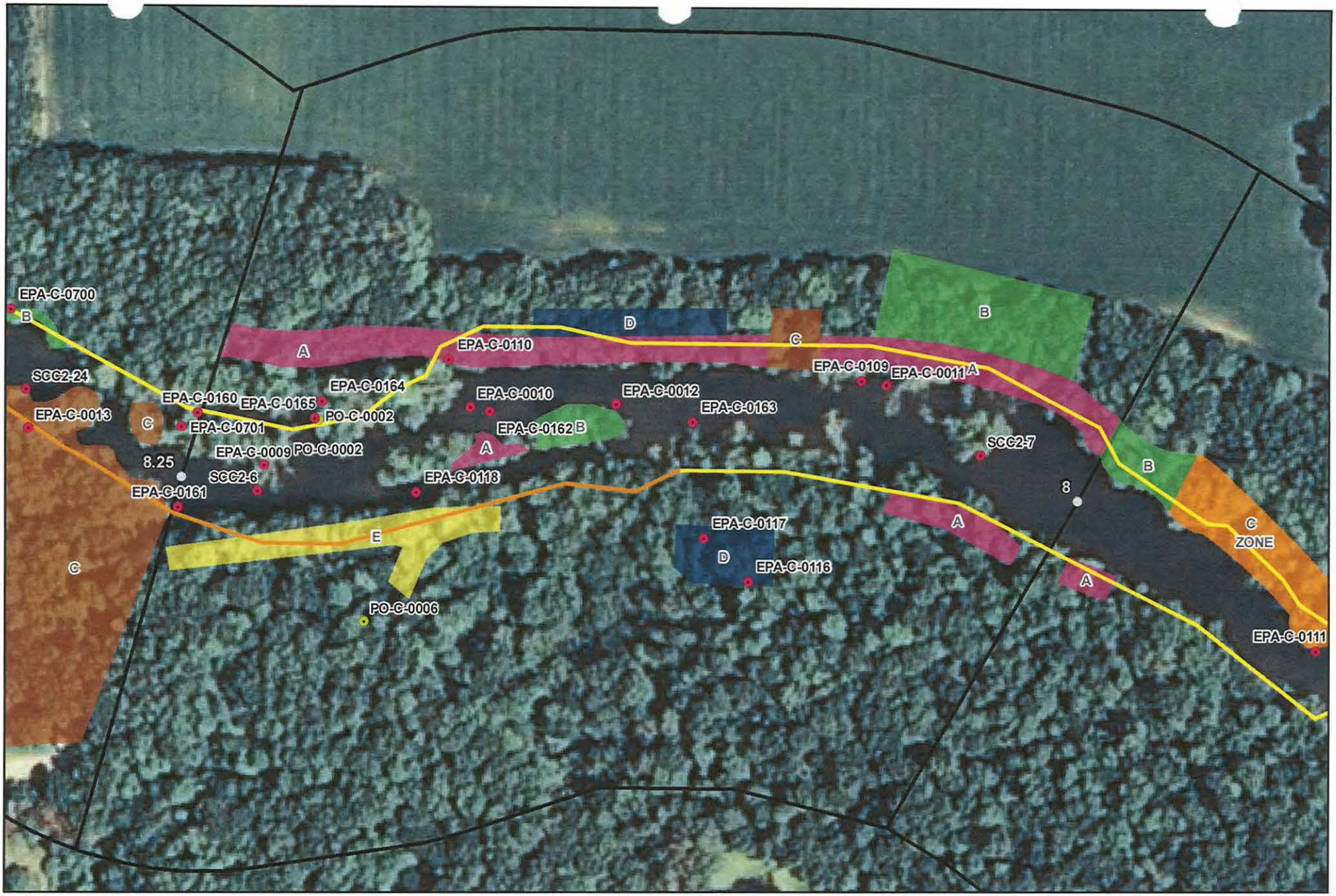


Sketch Y/N Photos Y/N (# ____) Video Y/N SOS form

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 8-8.25 Island									
EPA-C-0009	Island	SCAT-T1 8/15/2010			•		South side of island - interior sediment on east end oiled.	42.27960	-85.09953
EPA-C-0010	Island	SCAT-T1 8/15/2010					Interior of island - oiled sediment on the south side, east end.	42.27983	-85.09845
EPA-C-0164	Island	SCAT-T2 8/18/2010		•			Photo #26, 2m x 1m pool, 1m x 1m pool, several small 1m pools.	42.27985	-85.09923
EPA-C-0165	Island	SCAT-T2 8/18/2010		•			Photo #26, 2m x 1m pool, 1m x 1m pool, several small 1m pools.	42.27978	-85.09926
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 8-8.25 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

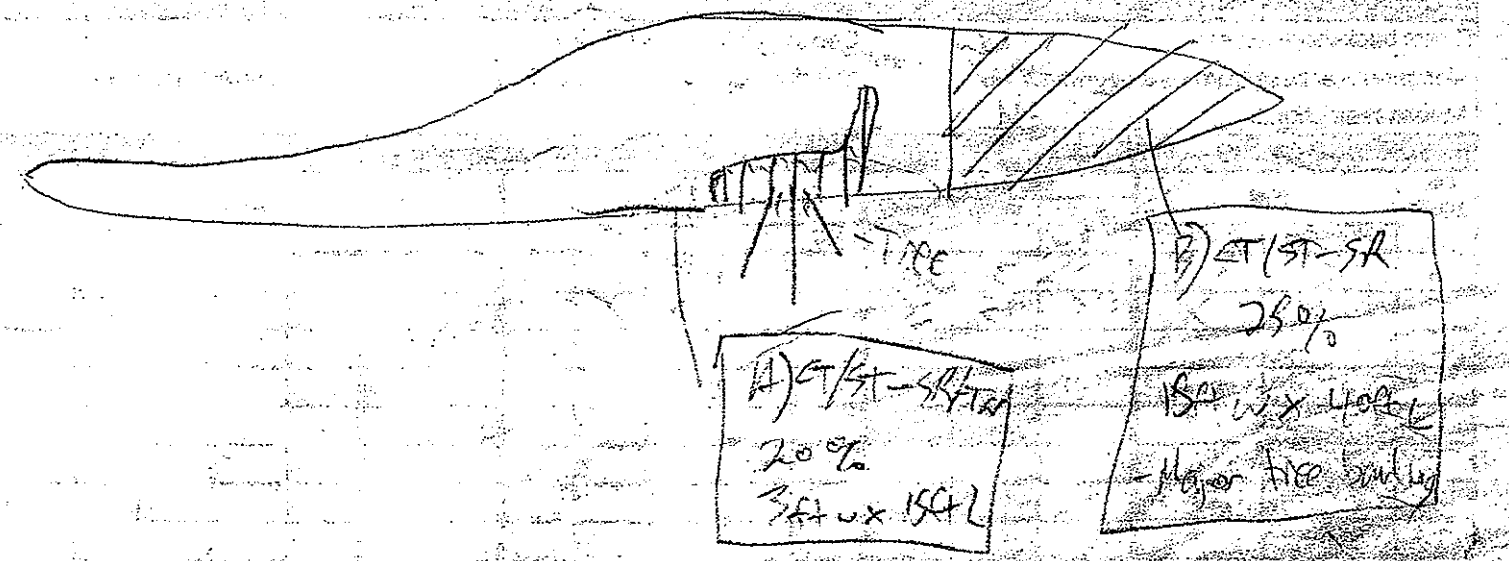
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

7. COMMENTS — cleanup recommendations — ecological/recreational/cultural/economic issues & constraints — wildlife obs. — Seg # _____

A) coating and surface residue on the shoreline dirt that can be scraped and removed.

B) Surface residue on soil or vegetation and shoreline that can be raked and removed.



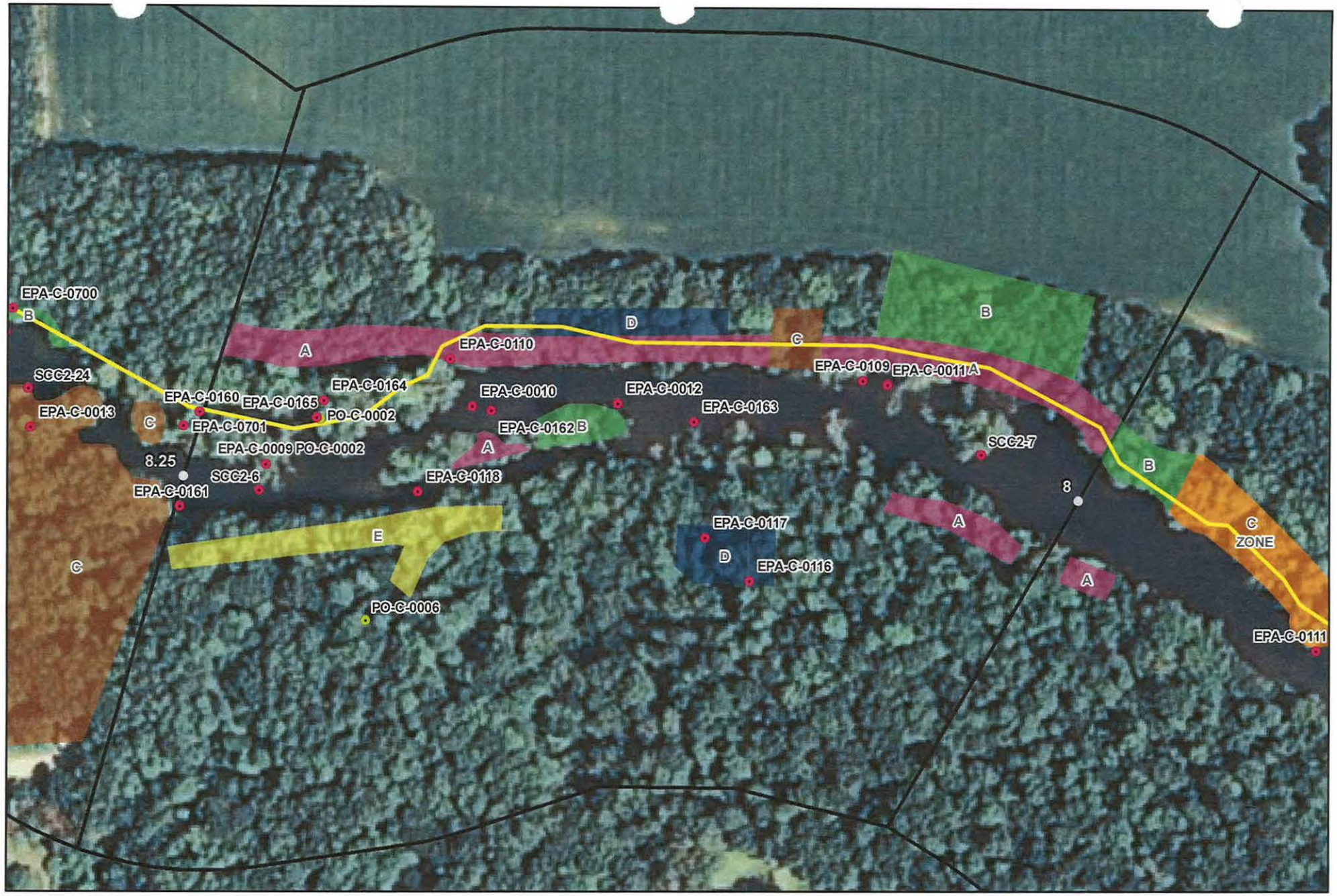
Sketch Y/N Photos Y/N (# _____) Video Y/N

SOS form

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 8-8.25 Right Bank While Looking Downstream									
SCC2-6	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	Large island - high impact. High volume flush. Skim ops or snare set up south of island.	42.27950	-85.09957
SCC2-7	Shoreline	Shoreline Assessment 8/6/2010	?		•	•		42.27967	-85.09577
PO-C-0002	Shoreline	PooledOil Obriens 8/18/2010					Pool Oil Observed	42.27978	-85.09925
EPA-C-0011	Main Channel	SCAT-T1 8/15/2010					Shoreline and back into uplands.	42.27993	-85.09627
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 8-8.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

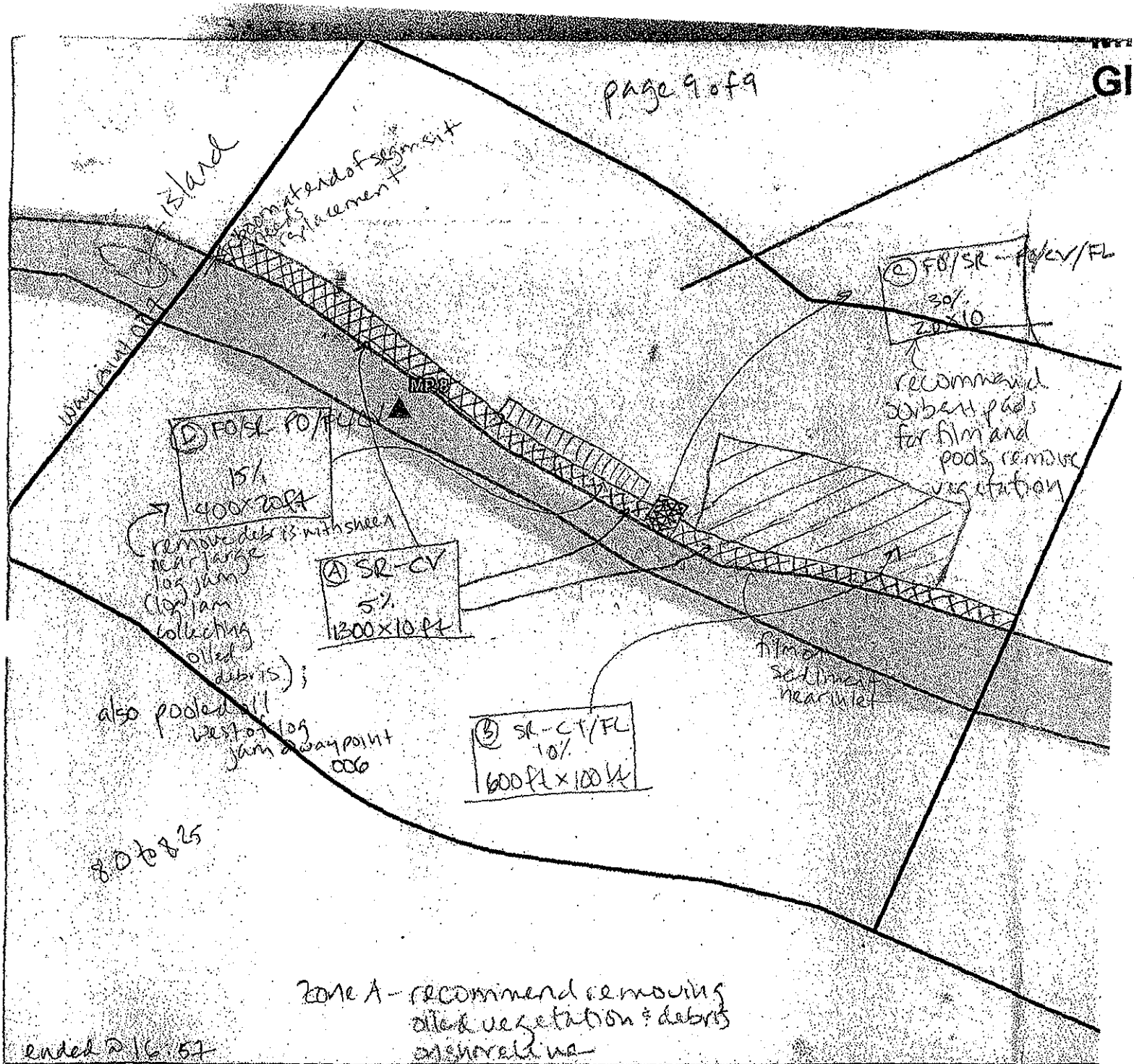
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Prepared for: U.S. EPA REGION V Contract No.: EP-S5-06-04 TDD: S05-0005-1007-030 DCN: 1154-4D-AHMS	**FOR OFFICIAL USE ONLY**	Prepared by: WESTON SOLUTIONS, INC. 2501 Jolly Road, Suite 100 Okemos, MI	DIVISION C - MILE POST 8 MARSHALL OIL ER MARSHALL, KALAMAZOO CREATED: AUGUST 20, 20

ion_C_Segment_C8_2010082011X17.mxd, 20-Aug-10 23:03, Dell

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/21/2010 **Time: AM / PM**

Operations Division: C **Segment ID: From** 3.0 **Start MP to End MP** 3.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island** **Overbank:** LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ SUN

Field Inspection Team

Enbridge Inspector: ROB KITCHEN

Division Supervisor(Contractor): CALEB T. KING

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

PL - C - 0006 - OVERBANK / WETLAND POOLED OIL - maintain w/ pom pom

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

COMPLETE

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

PUKE ISLAND - INSPECTED FROM BOAT

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

COMPLETE

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/21/10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 8.0 **Start MP to End MP** 8.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): PHILIP GARDNER

SCAT Reviewed – Description of Clean Up Required

Reviewed all items as outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 8-8.25 Left Bank While Looking Downstream										
PO-C-0006	Overbank	PooledOil Obriens 8/18/2010					Pool Oil Observed	42.27900	-85.09900	(Y) / N
EPA-C-0117	Shoreine and Overbank	SCAT-T2 8/21/2010		•	•		Patch of pooled oil that is actually tar on the soil surface. Should be raked/shoveled out.	42.27933	-85.09722	(Y) / N
EPA-C-0116	Shoreine and Overbank	SCAT-T1 8/21/2010		•	•		Patch of pooled oil that is actually tar on the soil surface. Should be raked/shoveled out.	42.27917	-85.09698	(Y) / N
EPA-C-0161	Main Channel	SCAT-T2 8/17/2010		•			Pooled oil. Some large spots 10-20 gallons. From 0159 to 0160.	42.27943	-85.09998	(Y) / N
EPA-C-0013	Main Channel	SCAT-T1 8/15/2010		•	•		Pooled oil approximately 100 feet back from river. Coating of vegetation all the way to the pool.	42.27973	-85.10077	Y / (N) more
EPA-C-0162	Main Channel	SCAT-T2 8/17/2010					Island on north side of LDB.	42.27982	-85.09836	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: Mike Van Loan, Chris Coan, Foss DelRosario

Date: 9/21/10

Comments:

EPA-C-0013 appears on the map in the following segment please investigate with in this SCAT recommendation table.

EPA-C-0118 (8/21) Please refer to the Kalamazoo Enbridge Spill clean up methods. 42.279 -85.099 (Y) / N

EPA-C-0163 (8/19) Please refer to the Kalamazoo Enbridge Spill clean up methods. 42.280 -85.097 (Y) / N

EPA-C-0013. oily pool still present. Does not look like work was done Called Chris and reported it. Hot shot crew came and cleaned it up.

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 8-8.25 Island										
EPA-C-0009	Island	SCAT-T1 8/15/2010			•		South side of island - interior sediment on east end oiled.	42.27960	-85.09953	(Y) / N
EPA-C-0010	Island	SCAT-T1 8/15/2010					Interior of island - oiled sediment on the south side, east end.	42.27983	-85.09845	(Y) / N
EPA-C-0164	Island	SCAT-T2 8/18/2010		•			Photo #26, 2m x 1m pool, 1m x 1m pool, several small 1m pools.	42.27985	-85.09923	(Y) / N
EPA-C-0165	Island	SCAT-T2 8/18/2010		•			Photo #26, 2m x 1m pool, 1m x 1m pool, several small 1m pools.	42.27978	-85.09926	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: Mike Van Loon, Chris Conn, Ross DelRosario

Date: 9/21/10

Comments:

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 8-8.25 Right Bank While Looking Downstream										
SCC2-6	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	Large island - high impact. High volume flush. Skim ops or snare set up south of island.	42.27950	-85.09957	(Y) / N
SCC2-7	Shoreline	Shoreline Assessment 8/6/2010	?		•	•		42.27967	-85.09577	(Y) / N
PO-C-0002	Shoreline	PooledOil Obriens 8/18/2010					Pool Oil Observed	42.27978	-85.09925	(Y) / N
EPA-C-0011	Main Channel	SCAT-T1 8/15/2010					Shoreline and back into uplands.	42.27993	-85.09627	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: Mike Van Loan, Chris Coan, Ross DeRosario

Date: 9/21/10

Comments:

EPA-C-0109 SCAT T1 (8/19) Please refer to Kalamazoo Enbridge spill clean up methods. 42.280 -85.096 (Y) / N
SCC2-6 is shown in map on left bank but is located in 8.25 right bank recommendation table.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From 8.0 Start MP to End MP 8.25 Segment Length: 0.25 mile

1. **SCAT** ☐

2. **Clean up** ☐

3. **Inspection**

[signature] 9/21/10 Enbridge
Signature (date)

[signature] 9/21/10 EPA
Signature (date)

4. **SCAT Reassessment**

[signature] 9/21/10 Enbridge
Signature (date)

[signature] 9/21/10 EPA
Signature (date)
ROSS DEL ROSARIO

[signature] 9/21/10 MDNRE
Signature (date)
Chris Court

5. **EPA**

[signature] 9/23/10 EPA Division Supervisor
Signature (date)

Island plan implemented and approved. Ops requested permission from Safety to remove DO NOT ENTER signs. As of 9/24/10, Safety had not yet approved.

Downstream end of LDB has several area which will require a long term plan. Due to the emerging oil issues. this area will require more than O+M. and will require an add'l "mini-plan" such as tilling. seeding. or other non-invasive approach. HEAVY excavation is NOT required. OSC Wagner conferred w/ Overbank Group and agreed a non-invasive approach is best.

Appendix E
Photographs

Field Photo Log – Segment 8.25



Photo 0669 – Facing south at left descending bank near EPA-C-0013.



Photo 0670 – Facing southeast at left descending bank near EPA-C-0161.

Field Photo Log – Segment 8.25



Photo 0673 – Facing east at island near SCC2-6/EPA-C-0009.



Photo 0675 – Facing south at left descending overbank near EPA-C-0013.

Field Photo Log – Segment 8.25



Photo 0681 – Facing northwest at left descending overbank.



Photo 0682 – Facing northwest at island near EPA-C-0012.

Field Photo Log – Segment 8.25

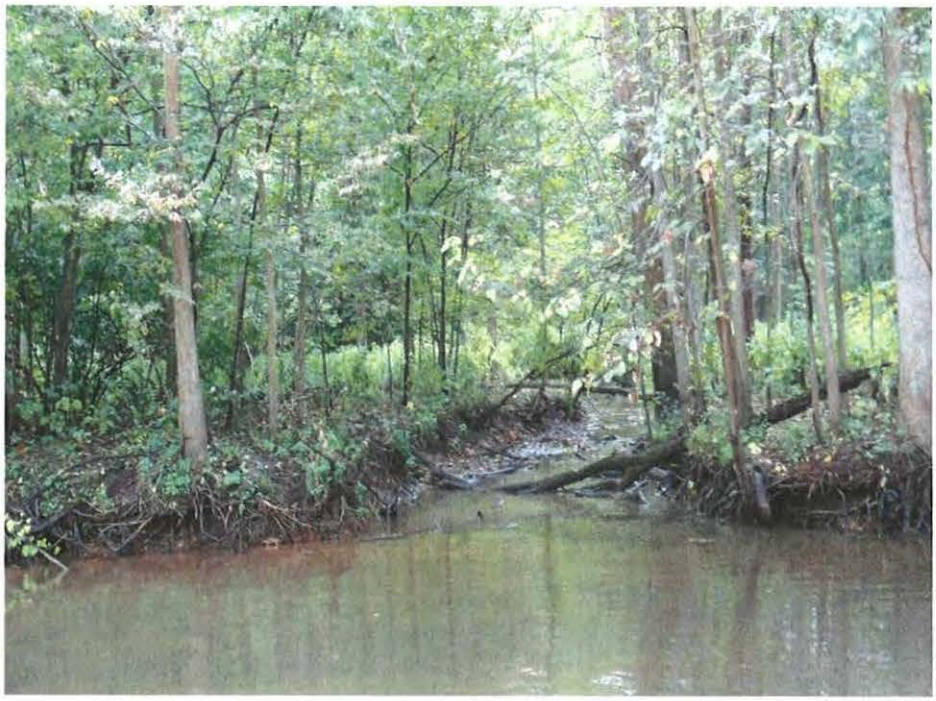


Photo 0684 – Facing southeast at left descending bank.



Photo 0685 – Facing east at left descending bank near EPA-C-0163.

Field Photo Log – Segment 8.25



Photo 0686 – Facing east at left descending overbank near EPA-C-0117.



Photo 0688 – Facing east at left descending bank near EPA-C-0116.

Field Photo Log – Segment 8.25



Photo 0690 – Facing southeast at left descending bank.



Photo 0692 – Facing northwest at island near SCC2-7.

Field Photo Log – Segment 8.25



Photo 0693 – Facing east at right descending bank near EPA-C-0011.



Photo 0694 – Facing west at right descending bank near EPA-C-0011.

Field Photo Log – Segment 8.25



Photo 0699 – Facing north at island near EPA-C-0002.



Photo 0701 – Facing southeast at right descending bank near EPA-C-0010.

Mile Post 8.25 Islands #1, #2, and Point #3 Action Plan

If approved, work is planned for Monday September 20th.

Brad Orsted – Enbridge Operations

Overview and Concerns:

These islands have oil contamination that is required to be removed by means of manual cutting and gathering of affected vegetation then collecting in bags for disposal. An unidentified substance on the island has created a possible unsafe breathing zone which will be controlled by use of supplied breathing apparatus (SBA with 30 minute egress).

- In the event of emergency the air horn will be activated and all workers must proceed to their respective boats. Medic / Safety boat personnel with SCBA will perform recovery if needed.
- Workers will be fit tested and competent in us of SCBA.
- In the event of a medical emergency the safety watch and one other worker will switch to SCBA by removing hose connection and assist in rescue.
- Boats, workers, and PPE will be deployed from C1.5
- Cascade system will be securely tied down within Air Supply Boat.
- Rest intervals will be determined based on worker input and weather conditions.
- All contaminated material will be double bagged and hauled to C1.5
- All safety requirements and procedures will be followed at each cleaning area.
- A pre-job hazard assessment and emergency plan review meeting will be held with all personnel immediately prior to leaving staging area.

Equipment, material, and manpower requirements:

Air Supply Boat – driver plus 2 workers (monitor cascade system and air lines)

- 10-man Cascade system and required hose for each worker.
- Tools and alarm device (air horn).

Transport Boat –

- Used to mobilize workers from C1.5 and around islands and point #3.

Worker Boat – driver plus 2 workers

- Gathers bagged material and brings supplies.
- Bags and spare PPE (extra poly coated tyvek suits, gloves, etc).
- Air Horn Alarm device.

Medic / Safety Boat – driver, medic, and two personnel for rescue if needed.

- Continues to monitor all work activities around the island and point work.
- 2- SCBA and 2- spare SCBA in event of emergency recovery.
- Air Horn Alarm device.

Procedures for Cleaning Island #1:

Island #1 (350' x 30') will be cleaned starting at location A. Transporter Boat will deploy a 9-man cutting crew in teams of 3 at point A and don breathing apparatus from Air Supply Boat. They will then proceed to cut out contamination working north to south (approximately 30 feet across in 10' strips). Each 3 man team will clean a 10 foot strip working north to south cutting and bagging material which will be dropped off on the south side of island and recovered by Work Boat. When 30 foot distance has been cleaned, each team will proceed back following their entry path while worker in Air Boat pulls back the air supply lines.

The 3 – 3 man teams will continue to clean in 10' swaths. After the 90 foot quarter section is cleaned and cutting crew is back in Transport Boat, they will redeploy to next quarter section of island and again connect to relocated breathing air lines and proceed to recover contaminated material in 10' paths working north to south of island.

This procedure for each quarter section of the 350' island will be followed to clean entire length.

Procedures for Cleaning Island #2: this island has been cleaned 90% and only spot cleaning will be required.

Island #2 (200' x 20') will be assessed to determine remaining contamination. A 3-man cutting crew from Worker Boat will access the island and connect to supplied breathing apparatus. They will then proceed to cut out remaining contamination and bag (approximately 20 feet across). The bagged material will be dropped off on the south side of island and recovered by Worker Boat. When Island #2 has been cleaned, each worker will proceed back following his entry path while worker in Air Supply Boat pulls back the air supply lines.

After Island #2 has been cleaned and cutting crew back in Worker Boat, they will redeploy to Point #3 and again connect breathing air lines and proceed to contain contaminated material in 10 foot paths.

Procedures for Cleaning Point #3:

Point #3 (100') will be cleaned starting at location A. A 9-man cutting crew from Transport Boat will access area at point A and don breathing apparatus. They will then proceed to cut out contamination working south to north (approximately 20'). Each 3-man team will clean a 10 foot strip working south to north cutting and bagging material which will be brought back with them and recovered by Worker Boat. When 100 foot area has been cleaned, each worker will proceed back following his entry path while worker in Air Supply Boat pulls back the air supply lines.

TASK HAZARD ASSESSMENT

Job Position &/or Task : __Island vegetation remediation operation._____ **Position Status :** Company x Contractor ❑

Project & Site Location : _ leak –Line 6B-**Date Completed &/or Revised** : __2010_____

KEY JOB FUNCTIONS &/OR TASKS	EQUIPMENT, MATERIALS,TOOLS & MACHINERY UTILIZED	RISKS (HEALTH & SAFETY HAZARDS)	HAZARD CONTROLS (PROTECTIVE DEVICES & EQUIPMENT, SAFE WORK PROCEDURES)
Access Site.	Personnel, Boats, Heavy equipment ,tools, supplies,	No Site contact. Soft terrain LEL 10PPM H_2S10PPM, CO and Benzene levels too high. Overhead power line Workforce not trained or familiar to work activities	Security in place for access control. Signage in place with direction to men working , proper PPE beyond this point All personnel must have site contact; all personnel must have site orientation to access site. Safe work permit with Initial atmospheric testing required, LEL-0, H_2S-0, Benzene <0.2ppm. Equipment to meet spark arrestor / shut- off requirements. Site conditions to be checked for soft areas and gravel or matting in place for access to be maintained. Industrial hygiene monitoring plan in place. Encroachment plan in place reviewed by electrical dept. Review Job scope with contractors to provide documentation on job scope capabilities

Control zones	Staging areas Hot zone	No site access approval No control of work zones No control of equipment Risk of spreading contaminated material	Permits tailgates equipment tracking and assignment. Staging area- Tool and equipment storage, PPE. Supplies. Island area cordoned off restricted access -permit required area monitoring.
MSDS	Heavy Crude Diluent Mix	Fire , exposure to H_2S, Benzene	Light hydrocarbons vapors will release from product at normal temperatures creating an explosive atmosphere. Vapor suppression may be required. Gas detection equipment for continuous LEL monitoring is required. Proper bonding techniques to prevent static.
Unknown contaminates	Breathing air compressor Cascade bottle system Bottle filler Bottle watch	Work force not trained Workers not fit for duty Worker exposure Air supply fails Air supply not meeting breathing air specifications. Bottles not secure. Improper handling of compressed gas cylinders. No bottle watch. No airline monitor.	Training records to be provided Medical clearance records available upon request. Continuous Atmospheric monitoring for LEL and H2S and spot sample for benzene. Proper fit testing in place for Supplied air system equipped with escape bottles. Air compressor certification in place and up to date to be supplied by contractor. Air bottles to be secured and

			place in upright condition on Air Supply Boat – driver plus 2 workers (monitor cascade system and air lines) 10-man Cascade system and required hose for each worker. - Tools and alarm device (air horn). boats.
Labour Personnel	Workers (, equipment operator, water craft, Personnel exposure to LEL, H2S, Benzene. Uneven ground Working with loose product. Vegetation clean up at stream banks Absorbent pads, MSDS for chemicals for cleaning.	Un trained workers Chemical / hydrocarbon exposure Strains, slips, trips falls, eye injuries, Worker exposed to product, oil, LEL, H_2S,CO, benzene No respirator fit testing. Exposure to other chemical products Drowning, Slips, trips and falls. Manual lifting and carrying of equipment and supplies. Personnel exposure, Contaminated clothing. Unstable stream banks. Underwater hazards. Open holes. Worker fatigue.	Identify training requirements. Fit testing records. Review MSDS for product leaked and surrounding area, Heavy crude oil/ Diluent mix. Spill cleanup meets precautions higher risk of exposure for working with hydrocarbons. Continuous Atmospheric monitoring for LEL and H2S and spot sample for benzene. Safe work permits required for all workers in restricted area. Wind socks in place Worker to use proper labor techniques. General PPE ,tyvek suits, barrier gloves. Hard hat glasses. Area monitoring LEL, benzene as per industrial hygiene plan Proper PPE to be worn. Decontamination zone- remove

			outer layer of clothing to prevent spreading oil contamination. underwater terrain Mark out to identify underwater / open holeshazards with flagging. Rest intervals will be determined based on worker input and weather conditions.
Industrial Hygiene	LEL, FID,PID,SO_2,O_2	Over Exposure(VOC, benzene)	Proper respiratory PPE to be worn based on Industrial hygiene plan. greater than or equal to (≥) 3% LEL to less than (<) 10% LEL Benzene 0.6 to 5 ppm half-mask APR with OV cartridge CO 25 ppm to 500 ppm half mask Follow 13-02-07 Enbridge book 2
		benzene	0 to 0.5 ppm none 0.6 to 5 ppm half-mask APR with OV cartridge 3M 6000 with 6003 cartridge 6 to 25 ppm full-face APR**1** with OV cartridge or SAR
		carbon monoxide	25 ppm to 500 ppm SCBA or SAR Scott Air-Pak
		hydrogen sulfide (H2S)	0 to 10 ppm none 11 to 99 ppm **5** SAR Type C supplied-air respirator 100 to 300 ppm SCBA or SAR with escape pak**6** Scott Air-Pak
		petroleum vapors	less than (>) 3% LEL none greater than or equal to (≥) 3% LEL to less than (<) 10% LEL half-mask APR with OV cartridge

			3M 6000 with 6003 cartridge greater than or equal to (≥) 10% LEL to less than (<) 20% LEL SCBA (or equivalent) for cold work; hot work is not permitted Scott Air-Pak
Material transfer	Boats ,barge	Fire, over fill, Unstable loads. No records waste material	Continuous gas monitoring, Follow load rating of boats barges Waste manifest. All contaminated material will be double bagged and hauled to C1.5
Storage set up	Roll off bins	Spill containment, static charge, truck loading, Fire, Cross contamination	Lining for 100% containment, , Grounding in place for tanks and truck loading. Only workers in charge of roll off stage equipment and document bins by number
Vehicle Maintenance	Heavy equipment	Workers not involved in clean up create hazard. Improper decontamination of equipment.	All work at site to be permitted and authorized. All contaminated equipment will be cleaned as per decon procedure as identified in the HASP.
Emergency response plan		Emergency on island Too long for emergency response for medical.	Emergency response plan plan to be reviewed and in place. In the event of emergency the air horn will be activated and all workers must proceed to their respective boats. Medic / Safety boat personnel with SCBA will

			perform recovery if needed Report to Muster point for head count. In the event of fire Notify Emergency response evacuate island and report to Muster point for head count. Medic / Safety Boat – driver, medic, and two personnel for rescue if needed. Continues to monitor all work activities around the island and point work. 2- SCBA and 2- spare SCBA in event of emergency recovery. Air Horn Alarm device.
Air monitoring	Public concerns	Odors , fugitive emissions	Maintain good communication with neighbors, environment to set up perimeter air sampling for fugitive emission measurement.
Health	people	Beaver fever insects Working in heat cold water- hypothermia	Wash hand at breaks before eating. Report insect bites medical facility. Follow procedures for working in hot, cold, and lightning.

Worker (Print Name) : _____ **Worker Signature** : _____

Foreman/Supervisor : _____ **Foreman/Supervisor Signature** : _____

Purpose

To protect workers where (a) air testing or monitoring, or a hazard assessment identifies an existing or potential breathing hazard, or where (b) respiratory or eye irritation or discomfort occurs due to airborne contaminants.

Scope

This includes selecting, using, and maintaining respiratory protection equipment.

Legislation

United States

Code of Federal Regulations (CFR), Title 29—Labor:

- Part 1910.134—Respiratory Protection

Related Standards

Canada

Canadian Standards Association (CSA):

- CSA Z94.4—Selection, Use, and Care of Respirators
- CSA Z180.1—Compressed Breathing Air and Systems
  - Table 1: Allowable Concentrations and Components for Compressed Breathing Air

Company

Book 2: Safety:

- 13-03-01 Filling Air Cylinders with the Cascade System
- 14-02-02 Portable Gas Detectors

Definitions

air-purifying respirator (APR)—passes contaminated air through an element which removes the contaminants and supplies purified air to a respirator inlet covering.

powered air-purifying respirator (PAPR)—uses a blower to pass contaminated air through an element that removes the contaminants and supplies the purified air to a respirator inlet covering.

self-contained breathing apparatus (SCBA)—allows the wearer to move about freely without the need to be connected to a stationary breathing air source.

supplied-air respirator (SAR)—provides air from a source other than the surrounding atmosphere (e.g., full-face respirator with hoseline).

tight-fitting respirator—includes half-mask APR, full-face APR, PAPR, SAR (excluding types with hoods), and SCBA.

Responsibilities

Regions

Regions are responsible for:

- coordinating respiratory protection training as required (see *15-02-01 Safety Training Matrix*)
- ensuring respirators are available, properly used and maintained, and cartridges are replaced as necessary
- arranging fit testing, and initial and ongoing medical evaluations with testing agency (i.e., pulmonary function test, spirometry examination)

CAN

- one month before scheduled medical evaluations, submitting a list of employees to be tested to Safety & Environment
- arranging follow-up tests or medical evaluations with testing agency as necessary
- participating in reviewing abnormal test results as necessary

Safety & Environment

Safety & Environment is responsible for:

- ensuring employee initial test result records are provided to the testing agency for ongoing testing
- liaising with the company's medical director, testing agency, regional safety coordinators, and employees regarding test result records, including safety concerns and any follow-up tests or medical evaluations required
- reviewing abnormal test results where there is a safety concern

CAN

- maintaining summaries of employee medical evaluation results

USA

NOTE: Human Resources maintains summaries of employee medical evaluation results.

Employees

Employees are responsible for:

- attending fit testing and medical evaluations
- following up abnormal test results
- attending follow-up tests or other medical evaluation required

Requirements

Medical Evaluations

All new field employees who may be required to wear a tight-fitting respirator must have an initial medical evaluation that is reviewed by a physician (i.e., baseline pulmonary function test or spirometry examination).

For new and transferred field office employees, summer and co-op students, and temporary employees, regional managers will determine initial medical evaluations at their discretion.

In addition to initial evaluations, ongoing medical evaluations are recommended for employees every 5 yrs (CAN), 2 yrs (APLI), or annually (USA).

Respirator Fit

Physical conditions (e.g., facial hair or temple pieces on glasses) must allow an effective facial seal with the respirator.

NOTE: Prescription eyeglasses with rubber strap temple arms or a spectacle kit, or alternatively contact lenses, may be worn with SCBA.

All workers, including field and office employees, who may be required to wear respiratory protection that depends on an effective seal must be clean-shaven where the facepiece contacts the skin; this may require trimming or removing mustaches.

Fit-Testing

Before wearing a respirator, employees must be fit-tested for the brand and model used.

Before each use of a respirator, perform a positive and negative pressure field fit-test to check the seal of the face mask.

Inspection and Maintenance

Inspect and maintain respiratory equipment in accordance with the manufacturer's specifications.

Visually inspect all respirators before and after each use.

For shared respiratory equipment, disinfect after each use and clean as necessary. For all other respirators, sanitize after each use and clean as necessary.

Workers may perform minor maintenance on hoseline breathing equipment (e.g., replace headbands, valves, gaskets, hoses, and clamps). Major maintenance and repairs must be performed by (a) a qualified worker (i.e., trained in cleaning, inspecting, and maintaining respirators), or (b) a certified technician from the supplier or manufacturer.

SCBA/Emergency Escape Paks

Visually inspect SCBA and emergency escape paks monthly.

CAN

Replace the breathing air in SCBA, emergency escape pak, and cascade system cylinders every 12 months.

Steel and aluminum SCBA cylinders and emergency escape pak cylinders must be hydrostatically tested every 5 yrs by a qualified service supplier. All other cylinders (e.g., carbon, fiberglass) must be hydrostatically tested every 3 yrs by a qualified service supplier.

NOTE: The most recent hydrostatic test date is stamped on the neck of the cylinder.

Each SCBA must be functionally tested in accordance with the manufacturer's specifications.

Cascade System
Cylinders used in a cascade system (or for hoseline equipment) must be hydrostatically tested by a qualified service supplier every 5 or 10 yrs.

NOTE: The most recent hydrostatic test date is stamped on the neck of the cylinder. The date format identifies the test interval:

- date alone or date followed by a plus sign (e.g., 4/89 or 4/89+) indicates a 5-year test interval
- date followed by an asterisk (e.g., 4/89*) indicates a 10-year test interval

CAN

Cylinders used in a cascade system should be returned to the supplier with at least 10 psi of air pressure remaining.

Upon receiving a cylinder from a supplier, ensure:
- cylinder identifies supplier/company name
- label identifies the contents and expiration date
- cylinder is painted yellow if used in the cascade system

Cartridges
Replace organic vapor (OV) cartridges and organic vapor/acid gas (OV/AG) cartridges after a total of 10-hrs use or 30 days, whichever comes first.

Immediately replace OV/AG cartridges if:
- used for escape from H2S concentrations >10 ppm
- damaged
- there is odor breakthrough

Replace filters when plugged, damaged, or soiled, or when breathing is difficult. If used in environments containing oil aerosols, replace oil-resistant filters after a total of 40-hrs use or 30 days, whichever comes first.

CAN

Compressor Systems for Breathing Air

Collect and test a sample of the breathing air from a compressor system:

- at least once every 6 months
- after major overhauls, modifications, or extensive repairs to the compressor system
- whenever contamination of the compressor system is suspected

NOTE: Obtain sampling instructions from the laboratory conducting the testing. The lab will provide test results of the breathing air sample.

The quality of breathing air from a compressor must be in accordance with CAN/CSA Z180.1-Table 1. If breathing air cylinders are filled by a supplier, records must be provided to verify compliance with Table 1.

Storage

Store respirators in clean plastic bags in a manner that prevents contamination and damage to the equipment.

Respirator Selection and Use

All respirators used must be approved by the National Institute for Occupational Safety and Health (NIOSH) or the Canadian Standards Association (CSA).

For work activities that are hazardous or potentially hazardous, see Table 1 and Table 2 for respiratory protection.

For any work activity where there is respiratory or eye irritation or discomfort, use a full-face APR.

If the concentration of the contaminant is unknown or there is a potential for a hazardous atmosphere (e.g., work around open systems), assume the atmosphere is hazardous, perform exposure assessments, and use respiratory protection in accordance with *Table 1* and *Table 2*.

Self-Contained Breathing Apparatus (SCBA)

⚠ WARNING: Workers using SCBA must leave the danger area when the alarm sounds, or when 20–25% of the operating time remains. Never remove the face mask while in the danger area.

Hoseline Breathing Equipment
Hoselines for breathing equipment must be less than 76 m (250 ft) in length.

Cylinders for hoseline breathing equipment must be equipped with a pressure-reducing regulator to control hoseline pressure below 1380 kPa (200 psi).

Breathing Hazards

Hydrogen Sulfide (H_2S)

NOTE: The low level alarm set point corresponds with the threshold limit value (TLV) for H_2S exposure; the high level alarm set point corresponds with the immediately dangerous to life and health (IDLH) for H_2S.

Hazardous levels of H_2S at company facilities are usually limited to confined spaces. Since H_2S is heavier than air, it can also accumulate in low areas, inside firewalls, and in ditches. Although the air in a sump or tank may test very low for H_2S, hazardous levels of H_2S may release into the air when the contents in the sump or tank bottoms is stirred.

Asbestos
Asbestos fibers inhaled into the lungs can lead to lung cancer, asbestosis, or mesothelioma.

The following materials are known or presumed to contain asbestos:

- insulation on abandoned waste heat boilers and piping
- plain and perforated asbestos board panels on interior walls and ceilings in some station buildings
- insulation on standby generator exhaust piping
- some floor tiles
- gasket material on pumping units and flanges on piping
- some pipe coating
- underground concrete electrical duct banks at terminal sites

Oxygen Deficiency
Normal air contains approximately 21% oxygen and 79% nitrogen. Less oxygen causes deep and rapid breathing. This progresses to dizziness, rapid heartbeat, headache, and a possible inability to move as the percentage of oxygen decreases to 16%. At 14% and lower, humans cannot survive.

Oxygen deficiency can develop in enclosed spaces, even in the absence of petroleum vapor. For example, in a sealed, cleaned tank, some oxygen is used up as the interior walls of the tank rust. As well, CO_2 and Halon fire extinguishing systems displace oxygen to put out a fire.

Abrasive Dusts
Abrasive blasting is commonly used to prepare surfaces before painting, coating, or lining. Abrasive blasting operations may create a breathing hazard from the blasting agent or from dusts generated during surface preparation.

Crystalline Silica (Refractory Materials)
Crystalline silica is found in the insulating materials commonly used to insulate crude oil heaters, including:

- Insulating Firebrick and Insulating Castable, which break down through the normal cycling of the heater and the turbulent flue gas, creating dusts that are disturbed on entry.
- Kaowool Blanket Products, which may contain crystalline silica after being exposed to temperatures above 1800°F.

Such temperatures are not unusual during normal operation of the crude oil heaters.

NOTE: For information on entry procedures and product MSDS, see the Crude Oil Heater Operations and Maintenance Manual onsite.

Records

SCBA/Emergency Escape Paks Monthly Inspections and Labels

Record monthly inspections of SCBA and emergency escape paks and retain onsite for 1 yr.

For emergency escape paks and SCBA not used routinely, label each respirator or storage bag with:

- inspection date
- name of worker completing the inspection
- findings, including remedial action required
- serial number or other identification

Air-Purifying Respirator Labels

Label APR storage bags with the (a) dates of inspection, cleaning, and maintenance, and (b) cartridge replacement schedule.

NOTE: Time logs are recommended for tracking cartridge use.

Pulmonary Function Test Results

Safety & Environment (CAN) or the testing agency (USA), under direction of the medical director, retains original Pulmonary Function Test results of employees permanently.

NOTE: Pulmonary Function Test results are confidential, accessible only to Safety & Environment and the medical director, and released only upon authorization from the employee or where there is a safety concern.

Quantitative/Qualitative Fit Test Results

Record Quantitative/Qualitative Fit Test results for each employee and retain until the next test.

Table 1
Summary of Respiratory Protection

Activity	Breathing Hazard	Respiratory Protection	Model Numbers	Comments
abrasive blasting	nonsilica silica dust, metals, recycled glass/glass-based dust	blaster: supplied-air bood or helmet with apron operated in continuous flow mode	Type CE	If using a self-contained system (e.g., Blastrac), half-mask APR with P100 dust filter may be used.
		helpers and workers in the blast area (within 100 ft downwind, 50 ft upwind, 70 ft if no wind): disposable dust mask or half-mask APR with P100 filter	3M 8210 or 3M 6000 with 2091 filter	
		helpers and workers in a confined space or in the immediate vicinity of blasting (within 50 ft downwind, 25 ft upwind, 30 ft if no wind): same as blaster		
	lead from lead-based paint	blaster: SAR with tight-fitting full-face mask in positive pressure mode		
		helpers and workers in the blast area (within 100 ft downwind, 50 ft upwind, 70 ft if no wind): disposable dust mask or half-mask APR with P100 filter	3M 8293 or 3M 6000 with 2091 filter	
		helpers and workers in a confined space or in the immediate vicinity of blasting (within 50 ft downwind, 25 ft upwind, 30 ft if no wind): same as blaster		
collecting spent abrasive blasting agent in confined spaces	very dusty air	0 to 0.5 hrs after abrasive blasting: supplied-air hood or helmet with apron operated in continuous flow mode	Type CE	
		more than 0.5 hrs after abrasive blasting: P100 filter	3M 8293 or 3M 6000 with 2091 filter	
	moderate dusty air	P100 filter		
	no visible dust	0 to 2 hrs after abrasive blasting: P100 filter		
		more than 2 hrs after abrasive blasting: none		

Table 1 - *continued*
Summary of Respiratory Protection

Activity	Breathing Hazard	Respiratory Protection	Model Numbers	Comments
collecting spent abrasive blasting agent in open spaces	very dusty air	0 to 0.5 hrs after abrasive blasting: supplied-air hood or helmet with apron operated in continuous flow mode	Type CE	
		more than 0.5 hrs after abrasive blasting: P100 filter	3M 8293 or 3M 6000 with 2091 filter	
	moderate dusty air	P100 filter		
	no visible dust	0 to 0.5 hrs after abrasive blasting: P100 filter		
		more than 0.5 hrs after abrasive blasting: none		
handling acids/caustics	corrosive mist, vapors, gas (e.g., hydrochloric acid, sulfuric acid, sodium hydroxide, chlorine)	half-mask APR with OV/AG cartridge with P100 filter	3M 6000 with 60923 cartridge	
removing asbestos materials	asbestos fibers	half-mask APR with P100 filter	3M 6000 with 2091 filter	
buffing, cutting, grinding	dusts and fumes	disposable dust mask or half-mask APR with P100 filter	3M 8293 or 3M 6000 with 2091 filter	
confined space entry	oxygen deficiency, mists, fumes, dusts, toxic vapors, gases	initial air testing from inside the confined space: SCBA	Scott Air-Pak	
		ongoing work: see Table 2		
drainup, work around open systems or exposed products	toxic organic vapors, hydrogen sulfide	initial exposure: half-mask APR with OV/AV cartridge	3M 6000 with 6003 cartridge	
		ongoing work: see Table 2		
applying herbicides and pesticides	toxic organic vapors or mists	half-mask APR with OV cartridge with dust/mist prefilter	3M 6000 with 60923 cartridge	

Table 1 - *continued*
Summary of Respiratory Protection

Activity	Breathing Hazard	Respiratory Protection	Model Numbers	Comments
lab operations	toxic organic vapors	normal operations: none		
		small spills: half-mask APR with OV/AV cartridge	3M 6000 with 6003 cartridge	
entering line heater	crystalline silica, refractory ceramic fibers	half-mask APR with P100 filter	3M 6000 with 2091 filter	
removing moldy ceiling tiles, bricks and various boards; mold remediation	biological aerosols	moldy area less than (<) 10 ft^2 N95	3M 8210	
		moldy area less than (<) 100 ft^2: half-mask APR with P100 filter	3M 6000 with 2091 filter	
		moldy area greater than (>) 100 ft^2: full-face APR with P100 filter	3M 6000 or 7000 full-face with 2091 filter	
painting and coating in enclosed and confined spaces with poor ventilation (n/a to water-based coating)	spraying: toxic organic mists	spraying: half-mask APR with OV/AG cartridge with P100 filter	3M 6000 with 60923 cartridge	
	spraying and brush/roller application: toxic organic vapors	brush/roller application: half-mask APR with OV cartridge	3M 6000 with 6001 cartridge	
	isocyanate (two-part coatings containing isocyanate)	spraying: SCBA or full-face SAR	Scott Air-Pak or 3M 6000 with 6001 cartridge	
		brush/roller application: half-mask APR with OV cartridge	3M 6000 with 6001 cartridge	

Table 1 - *continued*
Summary of Respiratory Protection

Activity	Breathing Hazard	Respiratory Protection	Model Numbers	Comments
pipe coating	hot tapecoat application: coal tar fumes (carcinogen)	tapecoat application: half-mask APR with OV/AG with P100 filter	3M 6000 with 60293 cartridge	
	coal tar felt wrap: asbestos fibers	hand removal: none (half-mask APR with P100 filter may be used)		
		mechanical removal: half-mask APR with P100 filter	3M 6000 with 2091 filter	
spill response	toxic organic vapors (e.g., benzene, petroleum vapors, toluene), hydrogen sulfide	first responder: half-mask APR with OV/AG cartridge	3M 6000 with 6003 cartridge	For respiratory protection in hot zones, see spill site safety plot plan.
		ongoing work: see Table 2		
tank cleaning	oxygen deficiency, toxic organic vapors, hydrogen sulfide	initial entry: SCBA or SAR with escape pak	Scott Air-Pak	
		ongoing work: see Table 2		
welding inside tanks or in areas with poor ventilation	toxic dusts and fumes	half-mask APR with P100 filter	3M 8293, or 3M 6000 with 2091 filter	

NOTES

- Equivalent disposable equipment in the 3M 5000 series may be used for 3M 6000 series equipment.
- In Canada, equivalent NIOSH-approved equipment may be used for 3M series equipment.
- 6003 OV/AG cartridges may be used for 6001 OV cartridges
- 3M 8293 respirators may be used for 3M 8210 respirators.

Table 2
Respiratory Protection for Exposure Concentrations

Breathing Hazard	Exposure Concentration	Respiratory Protection	Model
benzene	0 to 0.5 ppm	none	
	0.6 to 5 ppm	half-mask APR with OV cartridge	3M 6000 with 6003 cartridge
	6 to 25 ppm	full-face APR[1] with OV cartridge or SAR	3M 6000 or 7000 full-face with 6003 cartridge
	greater than (>) 25 ppm	SCBA or SAR	Scott Air-Pak
	greater than (>) 500 ppm (IDLH)[2]	planned work is not permitted[3]	
carbon monoxide	25 ppm to 500 ppm	SCBA or SAR	Scott Air-Pak
	greater than (>) 500 ppm	planned work is not permitted[3]	
hydrogen sulfide (H_2S) [4]	0 to 10 ppm	none	
	11 to 99 ppm [5]	SAR	Type C supplied-air respirator
	100 to 300 ppm	SCBA or SAR with escape pak[6]	Scott Air-Pak
	greater than (>) 300 ppm (IDLH)	planned work is not permitted[3]	
mercaptan	0 to 0.5 ppm	none	
	0.6 to 5 ppm	half-mask APR with OV cartridge	3M 6000 with 6003 cartridge
	6 to 25 ppm	full-face APR[1] with OV cartridge or SAR	Scott Air-Pak
	greater than (>) 25 ppm	SCBA or SAR	Scott Air-Pak
	greater than (>) 500 ppm (IDLH)[2]	planned work is not permitted	
natural gas	0 to 10% LEL	none	
	11 to 20% LEL	SCBA for cold work; hot work is not permitted[7]	Scott Air-Pak
	greater than (>) 20%	planned work is not permitted[3]	
oxygen deficiency	less than (<) 19.5%	SCBA	Scott Air Pak

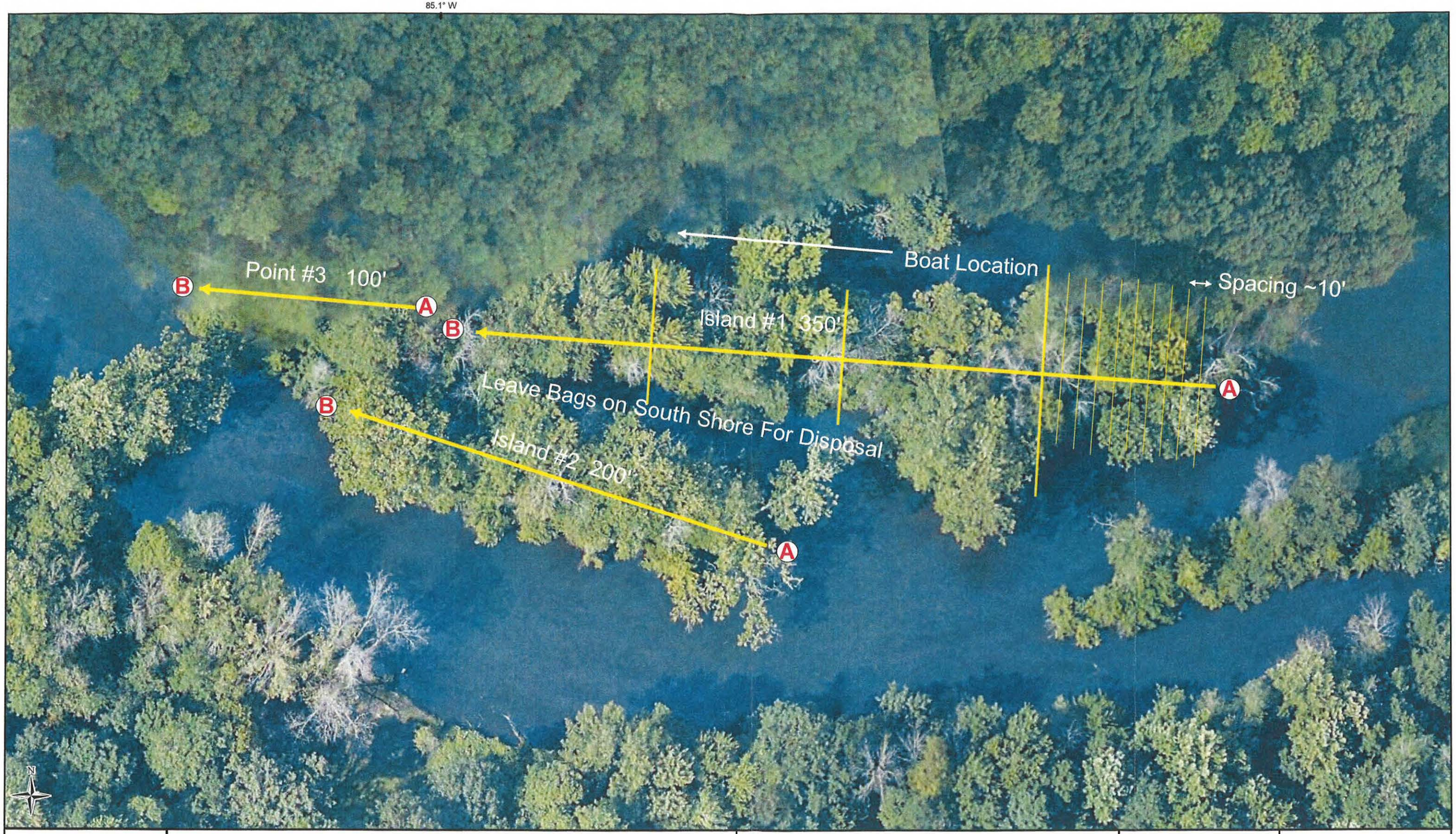
Table 2 - *continued*
Respiratory Protection for Exposure Concentrations

Breathing Hazard	Exposure Concentration	Respiratory Protection	Model
petroleum vapors	less than (>) 3% LEL	none	
	greater than or equal to (≥) 3% LEL to less than (<) 10% LEL	half-mask APR with OV cartridge	3M 6000 with 6003 cartridge
	greater than or equal to (≥) 10% LEL to less than (<) 20% LEL	SCBA (or equivalent) for cold work; hot work is not permitted	Scott Air-Pak
	greater than or equal to (≥) 20% LEL	planned work is not permitted[3]	

NOTES

1 If quantitative fit test performed.
2 Immediately dangerous to life and health.
3 Emergency work is allowed if SCBA or SAR with escape pak is used and all ignition sources are eliminated.
4 If the concentration exceeds the maximum detection limit of the H_2S detector, planned work is not permitted until the concentration has been verified.
5 Where possible, reset gas detectors monitoring H_2S to alarm at 10 ppm (low level) and 100 ppm (high level).
6 A safety watch with SCBA or SAR must be present.
7 Natural gas is composed of 95% methane. Methane is a simple asphyxiate; therefore does not have an allowable exposure limit. Methane displaces oxygen in the atmosphere; therefore, entry into areas where oxygen levels are greater than (>) 19.5% require SCBA.

85.1° W



Legend

0 25 50 75 100 Feet

Enbridge Energy, Limited Partnership

Line 6B MP 608 - Marshall, MI

MP 8.25 Island Cleanup Plan

DATE ISSUED:	Sept. 18, 2010
DATE REVISED:	
SCALE:	1:250
DRAWN BY:	MAD/JAI
SERIES:	

Natural Resources Engineering Co.
715-395-5680

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 8.50 – MP 8.25 to 8.50

Enbridge Energy

September 22, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 8.5 had moderate levels of oiling on the left descending bank including oil and tar covered vegetation and soil. Oiled vegetation and soils were also found up to 300 feet into the floodplain on the left overbank in zone C near Segment 8.25, as well as pooled oil. The east side of the island in this section was coated with oil and 5-10 small pools of oil. The right descending bank had light oiling with tar coated and covered vegetation located in zones A, B, and C. No operational focus areas were observed in the right descending overbank in zone A. It was also noted on the LDB overbank a large pool/mucky area of tarred vegetation connected by a channel to the river.

Actions

The shoreline clean-up activities within Segment 8.5 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Vegetation removal from the waterline leaving roots intact and woody plants greater than 2" in diameter;
- Cut, bag and removal of low hanging limbs extending over and into the water 2' above oiling level;
- Manual removal of oiled debris;
- Pooled oil removal.

Outcome

Pooled oiled areas in this section may continue to seep and could require monitoring and additional remediation. Oil staining was not removed to help insure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Areas of sheen along the left descending bank in zone C;
- Sheen on standing water on the left descending overbank in zone C;
- Sheen and tar covered vegetation and soil on left overbank;
- Oil clumps and sheen in pools of water near Segment 8.25 on right descending bank.

Segment 3.5 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 8.25-8.5 Left Bank While Looking Downstream										
EPA-C-0703	Shoreline	SCAT T3 09/04/2010					Tar Paddies deposited-all in this segment including pool oil at 100' of downstream WP 8.25. Clean up crews were in segment addressing pool. Significant spread of oil throughout shoreline and overbank as far back as toe of slope starting at MP 8.25 LDB	Flushing of Bank	42.28087	-85.10355
EPA-C-0704	Shoreline	SCAT T3 09/04/2010					Photos - 53,54,56. 125ft. N of MP 8.25 6' x 6' pooled oil. south end it zone pool on H20 close to toe of slope.; Tar Paddies deposited-all in this segment including pool oil at 100' of downstream WP 8.25. Clean up crews were in segment addressing pool. Significant spread of oil throughout shoreline and overbank as far back as toe of slope starting at MP 8.25 LDB	Pooled Oil Removal	42.28086	-85.10365
EPA-C-0705	Overbank	SCAT T3 09/04/2010					+-200ft from shoreline 4 flags in lowlying area in shrubs. Flag 1 closest to shoreline, unmarked shoreline closest to slope. There are 2 additional unnumbered flags delineating area.; Tar Paddies deposited-all in this segment including pool oil at 100' of downstream WP 8.25. Clean up crews were in segment addressing pool. Significant spread of oil throughout shoreline and overbank as far back as toe of slope starting at MP 8.25 LDB	Cut vegatation and remove	42.27989	-85.10152

9/11/10 BILL BATES, MIKE ZAMBETIS, ERNIE SARKIPATO

1.) NUMEROUS SHEEN AREAS REMAIN IN ZONE C AFTER POOL CLEAN UP AND SHOULD BE MONITORED THROUGHOUT THE O&M PHASE OF THE PROJECT.

2.) NUMEROUS SHEEN AREAS ALSO EXISTED IN THE OVERBANK AREAS BACK NEAR THE TOE OF SLOPE & SHOULD ALSO BE MONITORED IN LATER STAGES.

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 8.25-8.5 Left Bank While Looking Downstream									
SCC2-24	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	Oiled back 30-40 ft into floodplain.	42.27988	-85.10078
EPA-C-0159	Main Channel	SCAT-T2 8/17/2010		•			Pooled oil. Some large spots 10-20 gallons. From 0159 to 0160.	42.28006	-85.10156
EPA-C-0015	Main Channel	SCAT-T1 8/15/2010					Little cover off shore.	42.28028	-85.10160
EPA-C-0014	Main Channel	SCAT-T1 8/15/2010					Canoe partially submerged at shore.	42.28010	-85.10090
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									

8.5 LDB (see Colored aerial for LDB)

Zone C

Significant spread of oil/tar throughout shoreline to as far back as the toe of the slope starting at the MP 8.25. Straight back from there, at the toe, is a large pool/mucky area w/ tar on vegetation throughout. That area can be followed out to the river, with many tarred locations. This is a channel that oil flowed straight back to.

02.8 at 25.8

Victor Fulgoni – owner – 269-E 7-5411



Recommendations

Zone A: Rake around vegetation. only 2 person crew in Consideration & plants and owner. Cut veg. shovel pools and debris

Zone B: Same as Zone A

Zone C: Rake + Remove oiled veg and assoc. soils. Shovel out pools of oil, and pools for oil on top of water

Zone D: Rake and cut and remove oiled vegetation + debris

Eastwood, Augusta, Battle Creek, Kalamazoo, Climax, Marshall, Portage, KALAMAZOO, CALHOUN

Team 3 9-4-2010 LDB

Kalamazoo Oil Spill

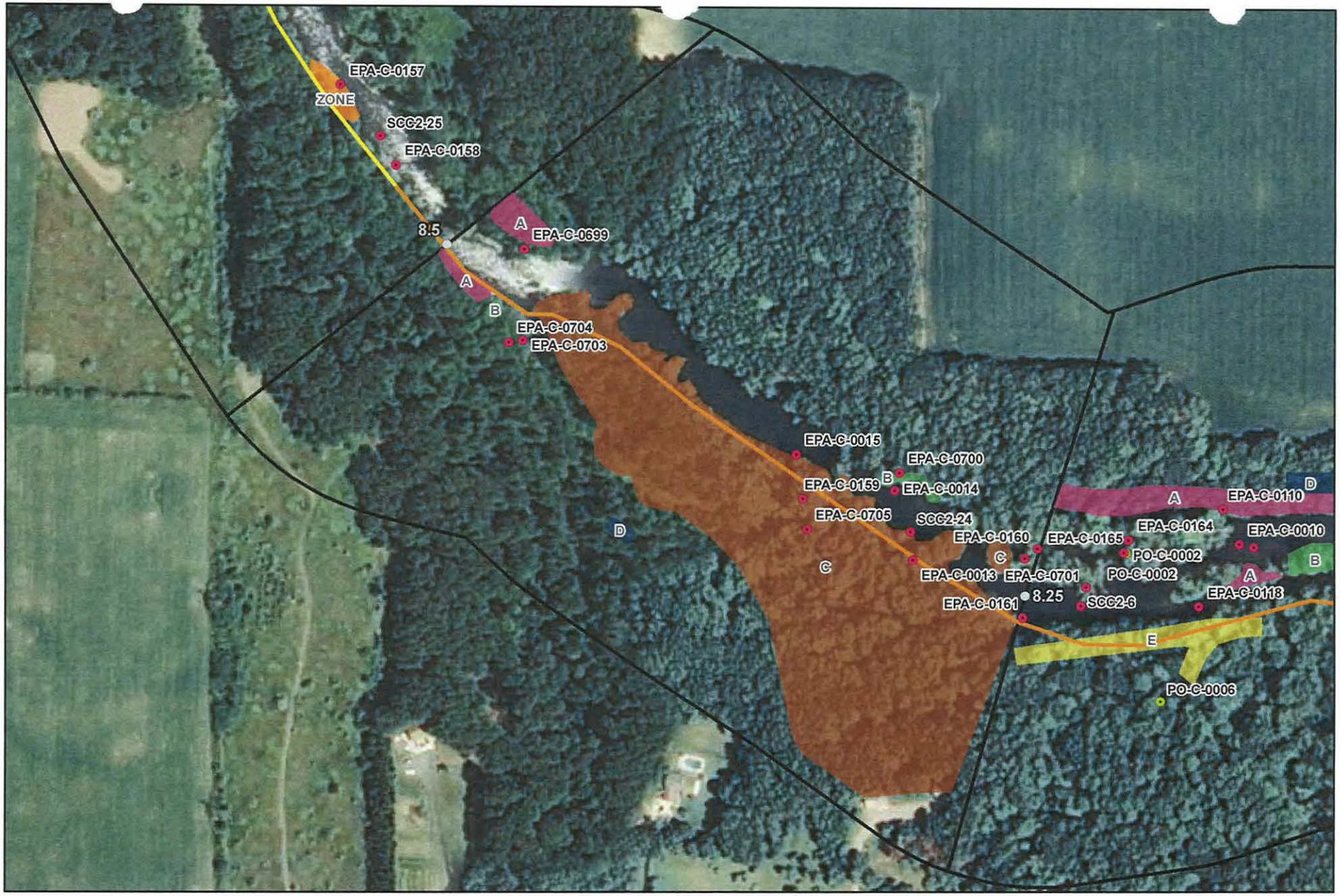
River Quarter Miles

Division Grid

0 150 300 Feet

Source: Aerial Photography,: USDA, 2010.

p. 4 & 4





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 8.25-8.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

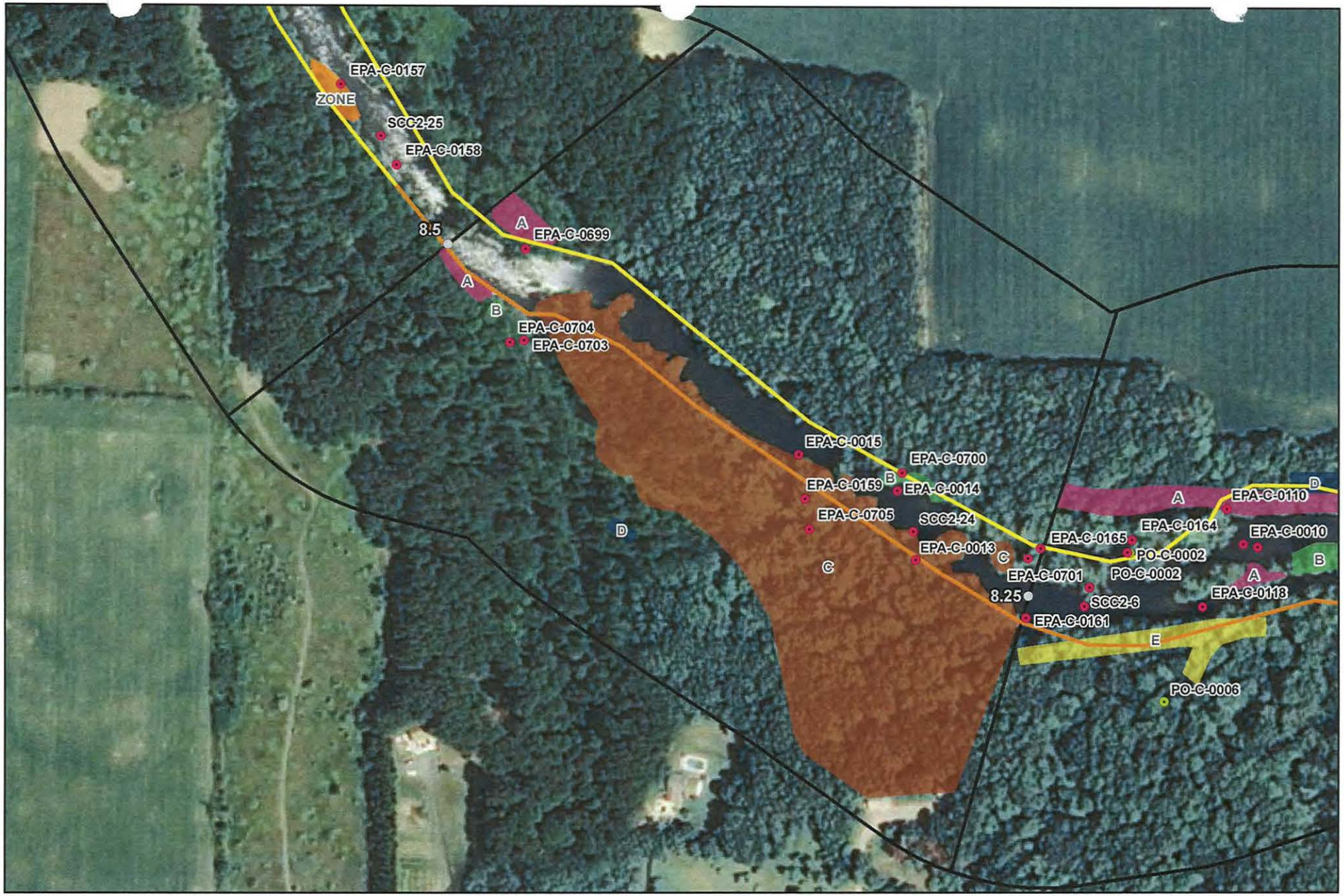
ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 8.25-8.5 Island									
EPA-C-0012	Island	SCAT-T1 8/15/2010					Island interior coated with oil across entire width of east end.	42.27822	-85.09338
EPA-C-0160	Island	SCAT-T2 8/18/2010					5-10 small pools approx. 1m x 1m. Photos #22-25. Could not access RDB side channel.	42.27980	-85.09989
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

Division C: Mile Marker 8.25-8.5 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

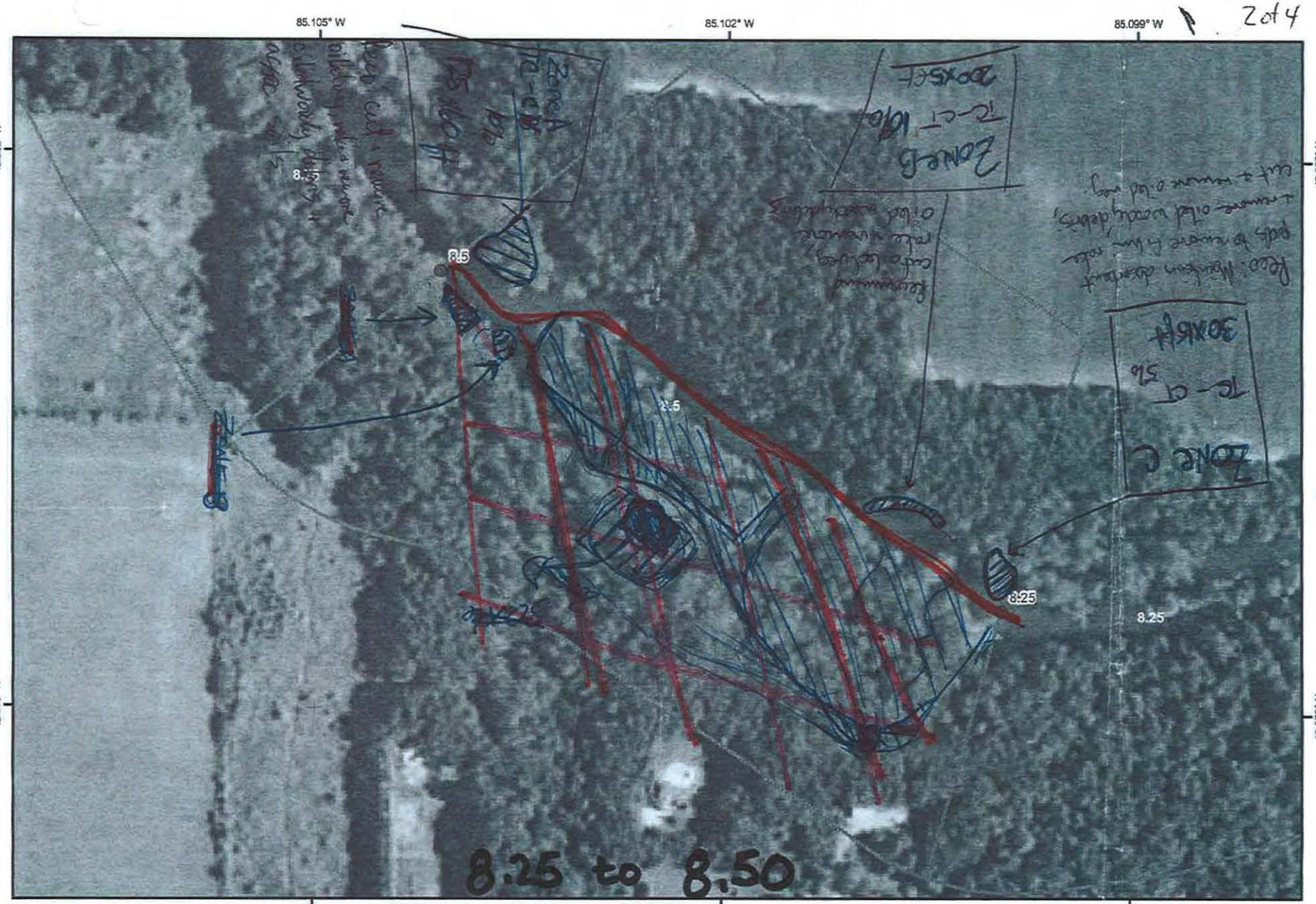
Source: Aerial Photography: USDA, 2009.

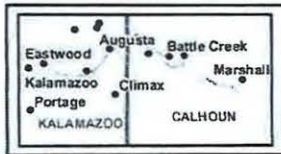
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 8.25-8.5 Right Bank While Looking Downstream									
EPA-C-0014	Unknown	SCAT-T2 8/15/2010					Canoe partially submerged at shore	42.28010	-85.10090
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





Team 3 09/04/10 *RD Bonly*

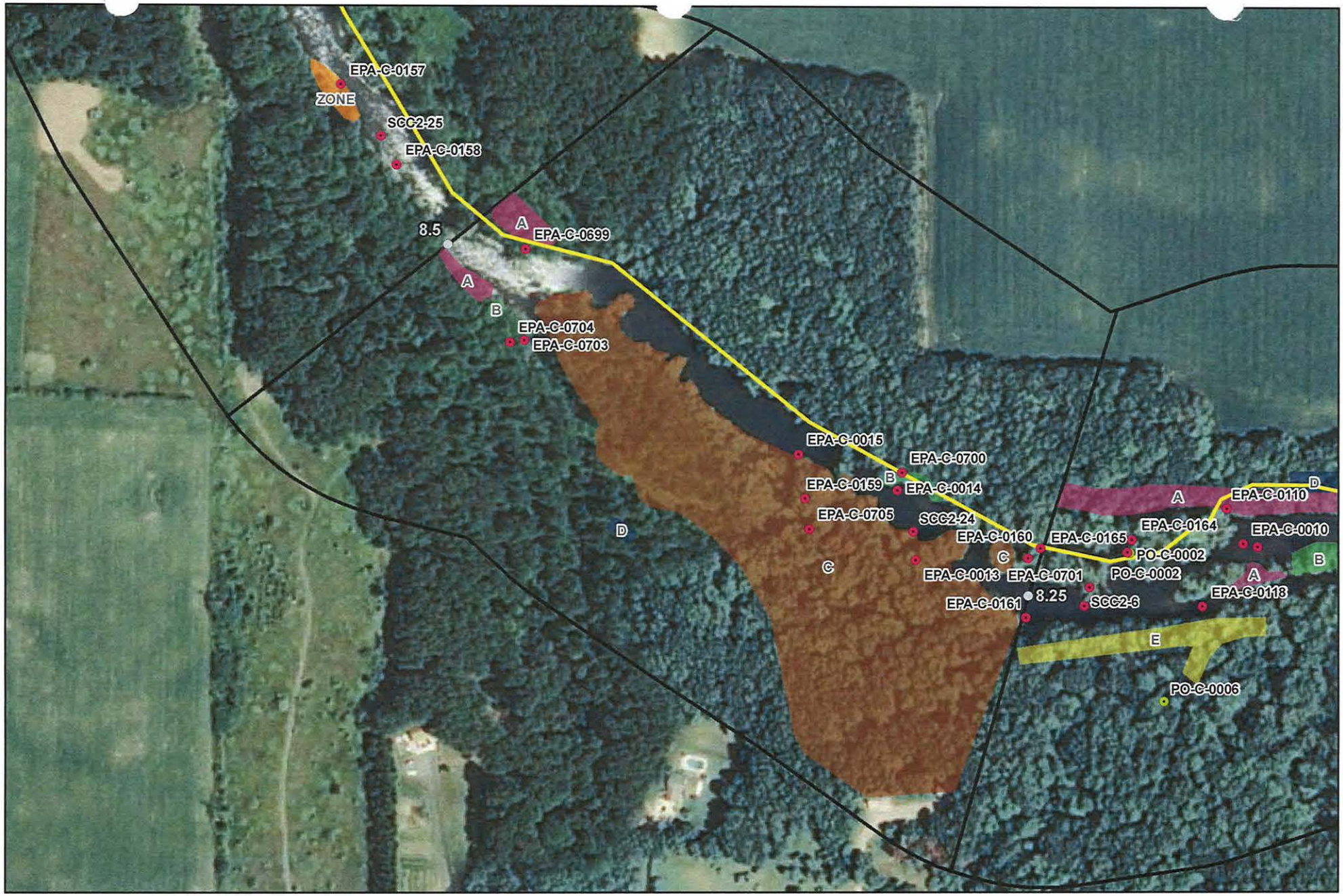
River Quarter Miles

Division Grid

Kalamazoo Oil Spill

0 150 300 Feet

Source: Aerial Photography,: USDA, 2010.





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

A B BC C D E F G H NO OIL ZONE

Division C: Mile Marker 8.25-8.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/7/10 Time: AM / PM 1030HRS

Operations Division: C Segment ID: From 8.25 Start MP to End MP 8.5 Segment Length: 0.25 mile

Bank: (LDB / RDB) ☑ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ SUN

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090710 Time: AM / PM 1145

Operations Division: C Segment ID: From 8.25 Start MP to End MP 8.5 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): Arnold Phillips

SCAT Reviewed – Description of Clean Up Required

Reviewed 7 areas outlined by SCAT.
Areas of concern require flushing, pulled oil, veg removal, debris

Clean Up Performed – Description of Clean Up Complete

☐ SCAT Requirements/Clean Up Complete

All work completed.

Punchlist Items Identified

☐ Punchlist Items Complete (add check on punchlist item when completed)

Note: Area approximately 4' in diameter leaching oil from soil. Crews monitoring area daily

N 47. 16. 8065 W 85 06. 0955

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 8.25-8.5 Left Bank While Looking Downstream										
SCC2-24	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	Oiled back 30-40 ft into floodplain.	42.27988	-85.10078	(Y) / N
EPA-C-0159	Main Channel	SCAT-T2 8/17/2010		•			Pooled oil. Some large spots 10-20 gallons. From 0159 to 0160.	42.28006	-85.10156	(Y) / N
EPA-C-0015	Main Channel	SCAT-T1 8/15/2010					Little cover off shore.	42.28028	-85.10160	(Y) / N
EPA-C-0014	Main Channel	SCAT-T1 8/15/2010					Canoe partially submerged at shore.	42.28010	-85.10090	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: BILL BATES, MIKE ZAMBETIS, ERNIE SARKIPATI

Date: 9/1/10

Comments:

NUMEROUS POOLED AREAS LOOK GOOD NOW, WILL LIKELY CONTINUE TO SEEP OVER TIME. NEEDS MONITORING, POSSIBLE REMEDIATION

ALSO OXBOW POOLS IN LOW OVER BANK, FOUND SHEEN AND TAR COVERED VEG/SOIL.

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 8.25-8.5 Right Bank While Looking Downstream										
EPA-C-0014	Unknown	SCAT-T2 8/15/2010					Canoe partially submerged at shore	42.28010	-85.10090	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: BILL BATES, MIKE ZAMBETIS, ERNIE SARKIPATO

Date: 9/11/10

Comments:

FOUND OIL CLUMPS & SHEEN IN POOLS NEAR MP 8.25. OPS PLACED SEVERAL (~6-8) SORBANT MATS. THERE IS A NEED FOR MONITORING AND POSSIBLY MORE ABSORBANT MATERIAL

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ **Segment ID: From MP** 8.25 **to MP** 8.50 **Segment Length: 0.25 mile**

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley (date) 10-Sept-2010 Enbridge

Signature Eugene Dennis (date) 9/10/10 EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBETIS (date) 9/11/10 Enbridge

Signature WILLIAM J BATES (date) 9/11/10 EPA

Signature ERNEST SANTIAGO (date) 9/11/10 MDNRE

5. **EPA**

Signature (date) 9/22/10 EPA Division Supervisor

Daily O/M of 8.25 8.5 LDB (by LaBraya for pt)
CW Chad notified
9/22/10

Appendix E
Photographs

Field Photo Log – 8.5



Photo 100-0295 – Facing east left descending bank.

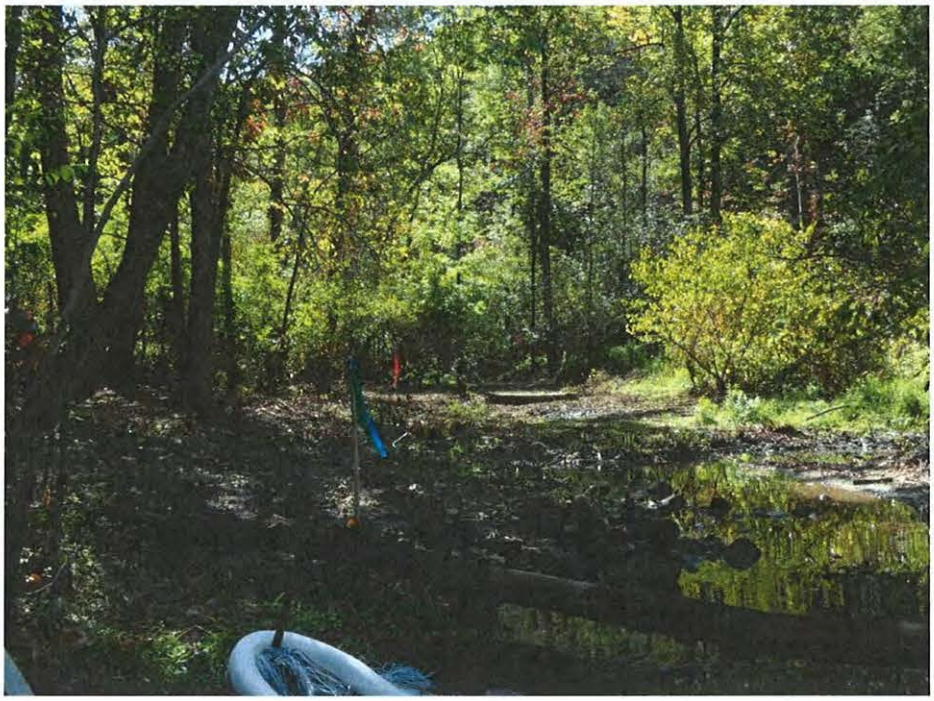


Photo 100-0297 – Facing south left descending bank near EpA-C-0015

Field Photo log – 8.5



Photo 100-0298 – Facing southwest left descending bank near SCC-2-024



Photo 100-0319 – Facing north right descending bank near EPA-C-0014

Field Photo log – 8.5



Photo SAM-0642 – Facing southeast at left descending bank



Photo SAM-0641 – Facing southeast at right descending bank near EPA-C-0015

Field Photo Log -8.5

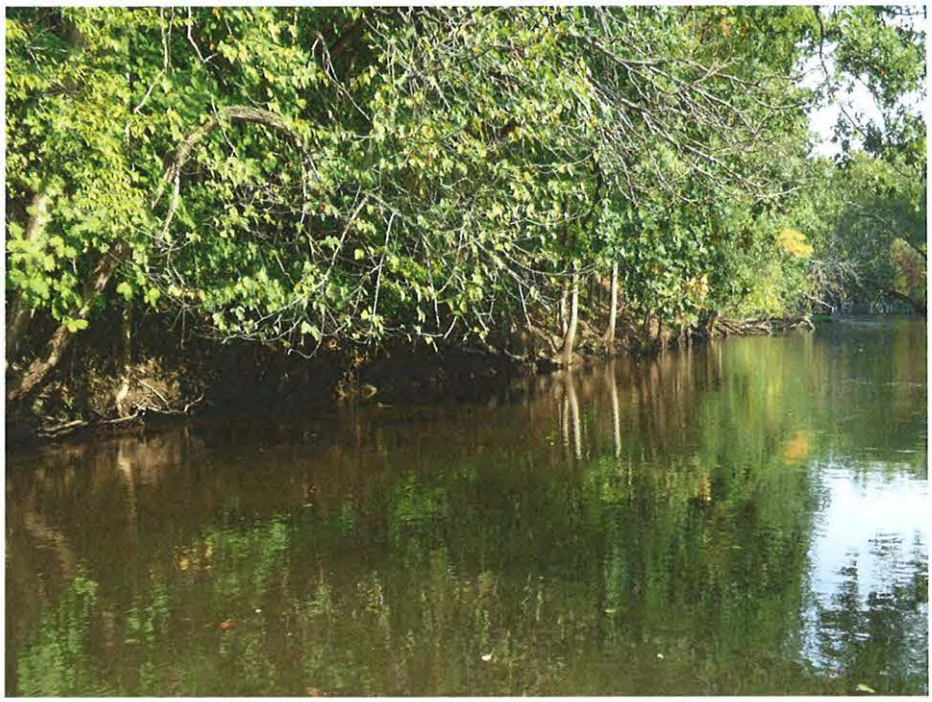


Photo SAM-0640 – Facing southeast at right descending bank

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 8.75 – MP 8.50 to 8.75

Enbridge Energy

September 23, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the response completion report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 8.75 had moderate to light oiling on the left descending bank and light oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were present, with heavy oiling observed on the island floodplain. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 8.75 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody vegetation on the left and right descending bank near MP 8.50
- Oiled woody vegetation and debris on right descending bank midway through the Segment and on the island
- Oiled stained trees by P-C-0005

Segment 8.75 has reached the operational endpoints pursuant to EPA's Clean Water Act. The appendices attached provide additional details on this segment.

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incide. .-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 8.5-8.75 Left Bank While Looking Downstream									
SCC2-25	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	Moderate oiling.	42.28193	-85.10458
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 8.5-8.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incide...-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 8.5-8.75 Right Bank While Looking Downstream									
SCC2-4	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	High volume flush.	42.28422	-85.10638
SCC2-5	Shoreline	Shoreline Assessment 8/6/2010	•	?	•	•	Island floodplain. 200'x50' is heavily oiled.	42.28298	-85.10520
PO-C-0005	Main Channel	PooledOil Obriens 8/18/2010					Pool Oil Observed	42.28400	-85.10600
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 8.5-8.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/7/10 Time: AM / PM 1100 HRS

Operations Division: C Segment ID: From 8.5 Start MP to End MP 8.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090110 Time: AM / PM 1745

Operations Division: C Segment ID: From 8.5 Start MP to End MP 8.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): Arnold Phillips

SCAT Reviewed – Description of Clean Up Required

Reviewed all areas outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work complete.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 8.5-8.75 Left Bank While Looking Downstream										
SCC2-25	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	Moderate oiling.	42.28193	-85.10458	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names:

Date: 9/10/10

Comments: William Bates, EPA; Ross Del Rosario (EPA); Pamela Rice, Enbridge/NRC; Ernest Sarkipato, DNRE

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 8.5-8.75 Right Bank While Looking Downstream										
SCC2-4 – This point is on the island	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	High volume flush.	42.28422	-85.10638	(Y) / N
SCC2-5	Shoreline	Shoreline Assessment 8/6/2010	•	?	•	•	Island floodplain. 200'x50' is heavily oiled.	42.28298	-85.10520	(Y) / N
PO-C-0005	Main Channel	PooledOil Obriens 8/18/2010					Pool Oil Observed	42.28400	-85.10600	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: Pamela Rice - Enbridge/NRC,
Bill Bates - EPA
Ernie Sarkipato DNRE
Ross del Rosario, USEPA

Date: 9/10/10

Comments:

EPA -C-0157 and 0158 NA NA No Comments or Recommendations

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ **Segment ID: From MP** 8.50 **to MP** 8.75 **Segment Length: 0.25 mile**

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Ken Costley 09-Sept-2010 Enbridge
Signature (date)

Gary A. Andrew 9.9.10 EPA
Signature (date)

4. **SCAT Reassessment**

Pamela E. Rice 9/10/10 Enbridge
Signature (date)

9/10/10 EPA R. Del Rosario 9/10
Signature WILLIAM J BATES (date) ROSS DEL ROSARIO

9/10/10 MDNRE
Signature (date)

5. **EPA**

Christine Wagner to 9/22/10 EPA Division Supervisor
Signature (date)

Not approved 9/19 CWagner
Inspected 9/9 10 am. SCAT point EPA 0158 is still red-flagged. Also tricle patches of shiny oil on overbank between 15-20 ft. from shore. This area needs add'l work. Referred to O'Brien for Jet Shot Team. CW
SCAT points downstream at MP 8.75 marker are cleared. OK to remove sorbent boom on LDB across from 8.75 RDB marker CW

Appendix E
Photos



Photo 0290 – Looking southeast at left descending bank.



Photo 0291 – Looking southeast at left descending bank.



Photo 0292– Looking southwest at left descending bank. Near EPA-C-0157.



Photo 0293 – Looking southwest at left descending bank. Near SCC2-25.



Photo 0294 – Looking southwest at left descending bank. Near EPA-C-0158.



Photo 0314 – Looking northwest at island. Near SCC2-4.



Photo 0315 – Looking northeast at right descending bank. Near PO-C-0005.

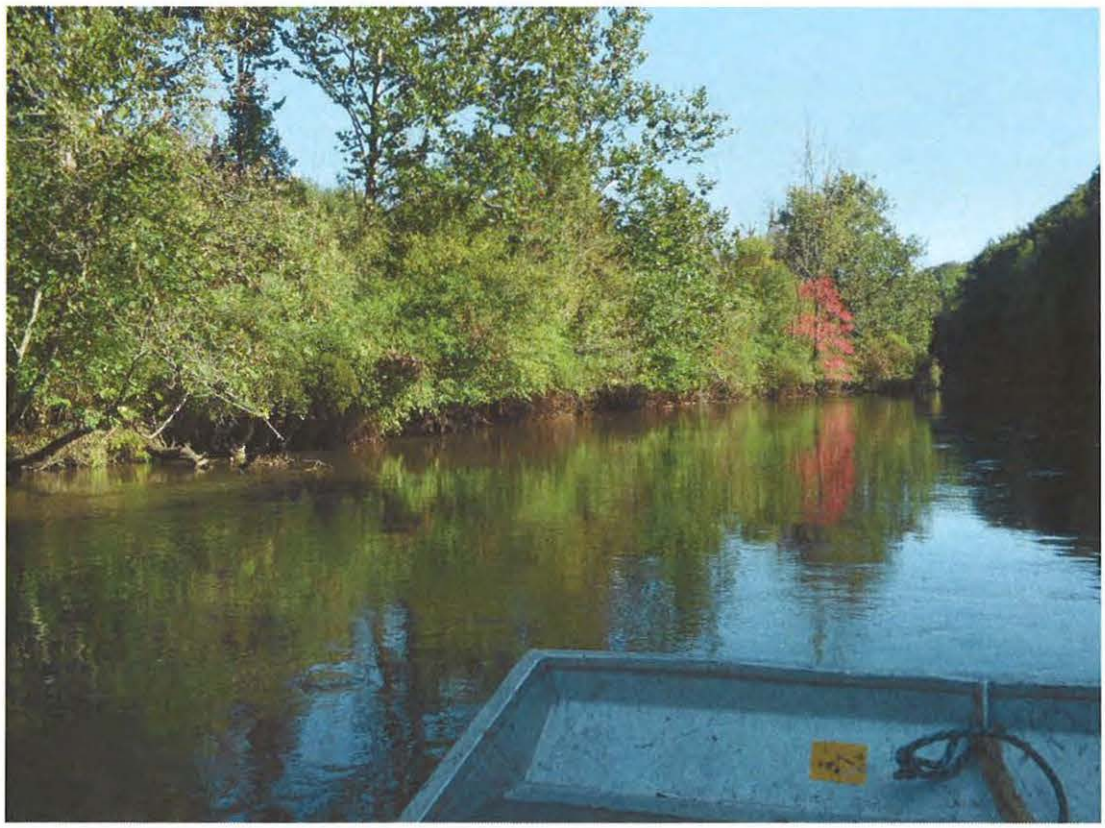


Photo 0316 – Looking southeast at right descending bank. Near SCC2-5.

Field Photo Log – Segment MP 8.75



Photo 0317 – Looking southeast at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 9.00 – MP 8.75 to 9.00

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 9.00 had light oiling on the left and right descending bank, including pooled oil, and oiled vegetation. The islands present contained wetlands with heavy oiling and pooling of oil. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 9.00 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact.
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris
- Removal of pooled oil.

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled debris along left descending bank near MP 9.00
- Oiled woody vegetation along right descending bank
- Oiled woody vegetation along left descending bank

Segment 9.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

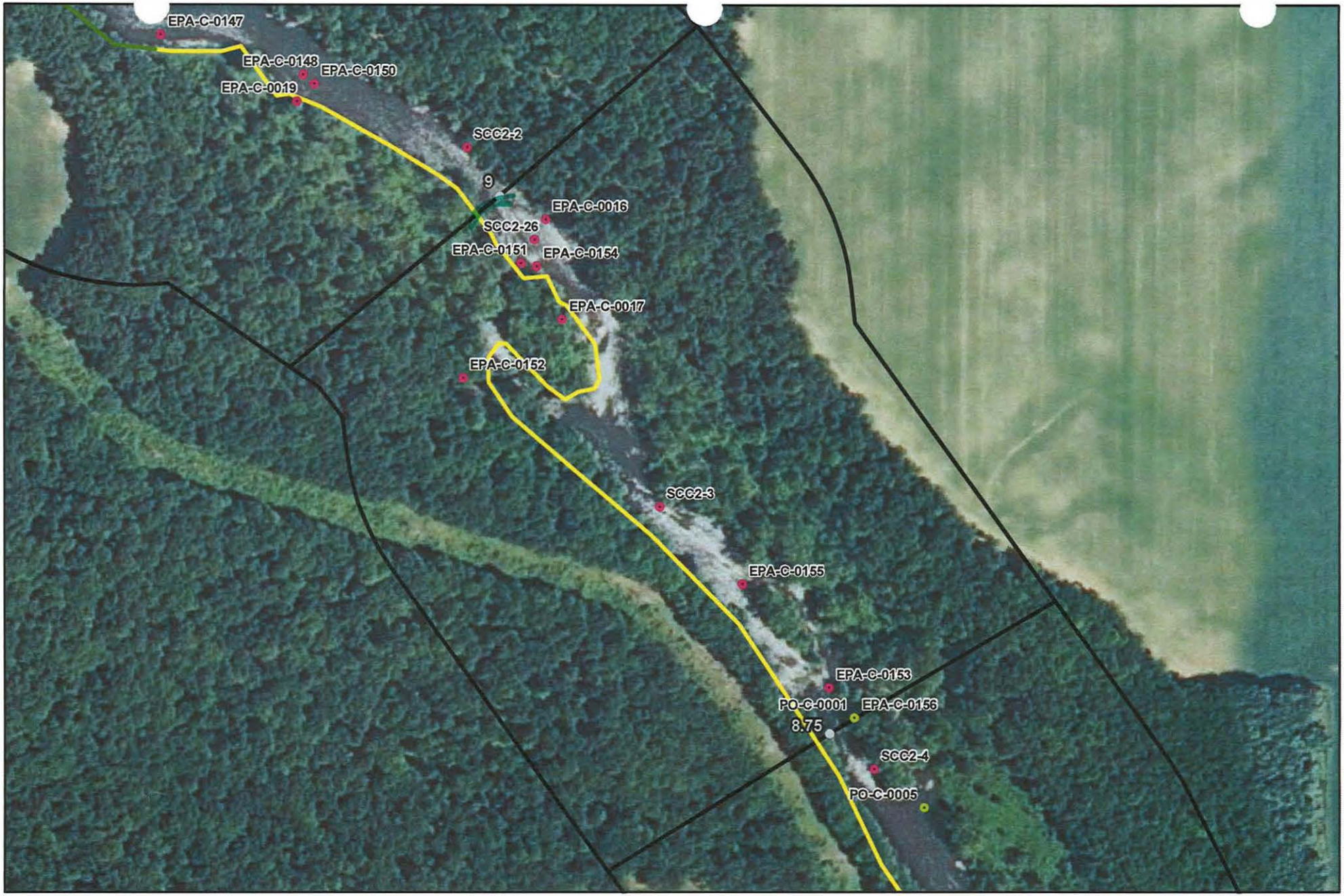
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incide...-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 8.75-9 Left Bank While Looking Downstream									
SCC2-26	Shoreline	Shoreline Assessment 8/6/2010	●		●		Moderate oiling.	42.28718	-85.10900
EPA-C-0152	Main Channel	SCAT-T2 8/17/2010					Oxbow at upstream end. Oil came on to bend with pooling ~ 50-100 gallons.	42.28640	-85.10954
EPA-C-0153	Main Channel	SCAT-T2 8/17/2010					On south side of island.	42.28467	-85.10674
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 8.75-9
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

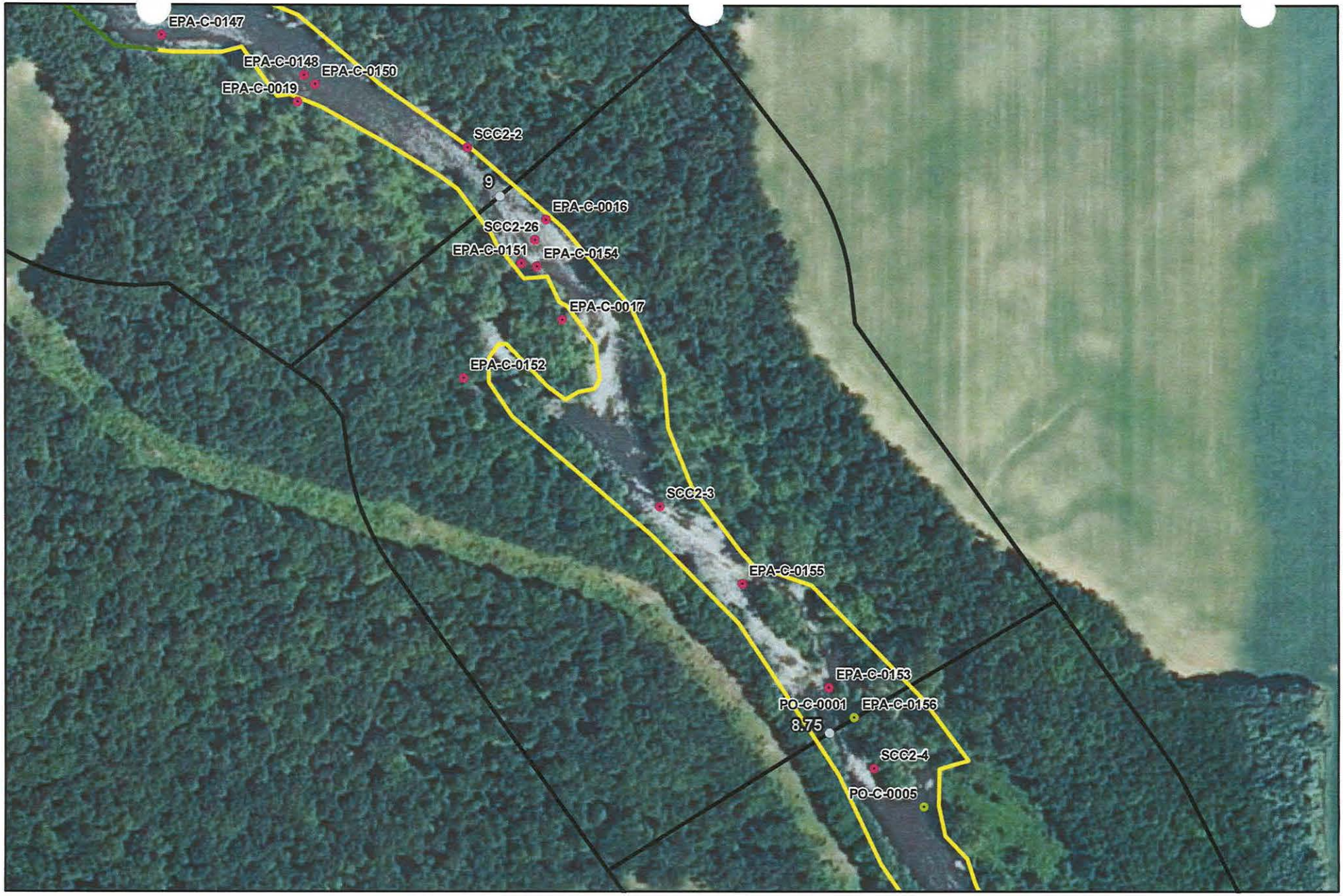
ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incide...-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 8.75-9 Island									
EPA-C-0017	Island	SCAT-T1 8/15/2010		●	●		Need boom. Vegetation weeping oil back into wetland. Heavy oiling *pooled oil*. South side of river across from C3.	42.27933	-85.09722
EPA-C-0154	Island	SCAT-T2 8/18/2010		●			2 large pools (2m x 3m) and several smaller pools. Photos #12-17.	42.28703	-85.10899
EPA-C-0155	Island	SCAT-T2 8/18/2010		●			3 pools. 1/2 m x 1/2 m. Photos #18-19.	42.28525	-85.10740
EPA-C-0156	Island	SCAT-T2 8/18/2010		●			15m x 4m pool, 3m x 4m pool. Photos #20-21.	42.28450	-85.10654
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 8.75-9 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

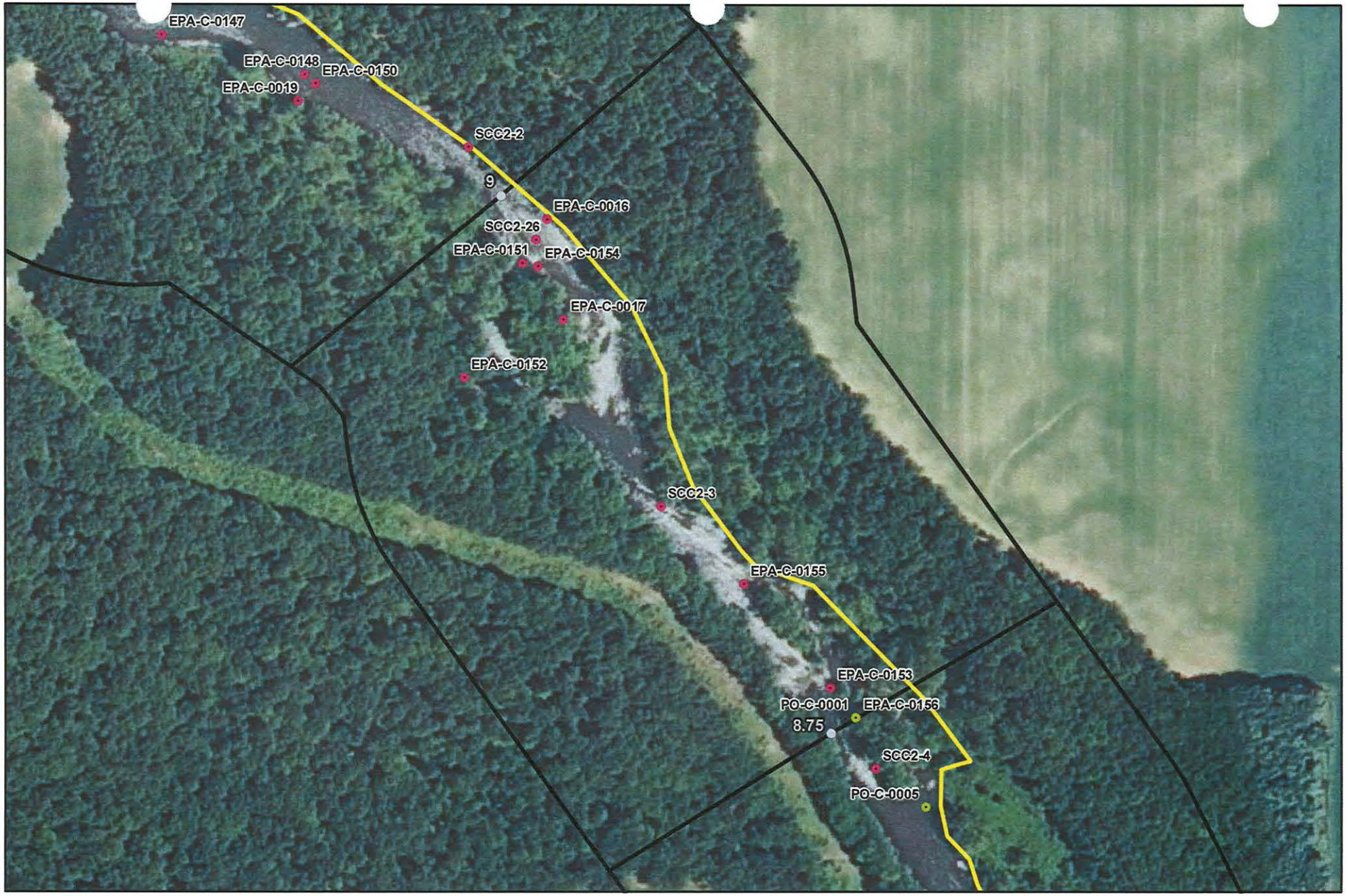
ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incide. .-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 8.75-9 Right Bank While Looking Downstream									
SCC2-3	Shoreline	Shoreline Assessment 8/6/2010			●	●		42.28568	-85.10803
PO-C-0001	Shoreline	PooledOil Obriens 8/18/2010					Pool Oil Observed	42.28450	-85.10654
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 8.75-9
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/7/10 Time: AM / PM 1300

Operations Division: C Segment ID: From 8.75 Start MP to End MP 9 Segment Length: 0.25 mile

Bank: LOB / RDB ☑ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ SUN

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090710 Time: AM / PM 1400

Operations Division: C Segment ID: From E75 Start MP to End MP 9 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): Arnold Phillips

SCAT Reviewed – Description of Clean Up Required

All items outlined by SCAT have been reviewed.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work complete.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 8.75-9 Left Bank While Looking Downstream										
SCC2-26	Shoreline	Shoreline Assessment 8/6/2010	●		●		Moderate oiling.	42.28718	-85.10900	(Y) / N
EPA-C-0152	Main Channel	SCAT-T2 8/17/2010					Oxbow at upstream end. Oil came on to bend with pooling ~ 50-100 gallons.	42.28640	-85.10954	(Y) / N
EPA-C-0153	Main Channel	SCAT-T2 8/17/2010					On south side of island.	42.28467	-85.10674	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: Bill Bates, Ernest Sarkipato, Pamela Rice, Ross DelRosario

Date: 9/10/10

Comments:

EPA-C-0116 on map, No comments or Recommendations

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 8.75-9 Right Bank While Looking Downstream										
SCC2-3	Shoreline	Shoreline Assessment 8/6/2010			●	●		42.28568	-85.10803	Y / N ~ point was not ident.
PO-C-0001 The 3 [illegible] island	Shoreline	PooledOil Obriens 8/18/2010					Pool Oil Observed	42.28450	-85.10654	Y / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: Bill Bates, Ross DelRosario, Ernie Sarkiepato, Pamela Rice

Date:

Comments: 9/10/10

[illegible]



Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 8.75-9 Island										
EPA-C-0017	Island	SCAT-T1 8/15/2010		•	•		Need boom. Vegetation weeping oil back into wetland. Heavy oiling *pooled oil*. South side of river across from C3.	42.27933	-85.09722	(Y) / N
EPA-C-0154	Island	SCAT-T2 8/18/2010		•			2 large pools (2m x 3m) and several smaller pools. Photos #12-17.	42.28703	-85.10899	(Y) / N
EPA-C-0155	Island	SCAT-T2 8/18/2010		•			3 pools. 1/2 m x 1/2 m. Photos #18-19.	42.28525	-85.10740	(Y) / N
EPA-C-0156	Island	SCAT-T2 8/18/2010		•			15m x 4m pool, 3m x 4m pool. Photos #20-21.	42.28450	-85.10654	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: BILL BATES, MIKE ZAMBETIS ERNIE SALKIDATO

Date: 9/11/10

Comments:

ID SCC2-4 is also located on an island

ID = PO-C-0001 located on island

ID EPA-C-0153 is also located on an island

The island at M.P. 8.75 will likely pool and sheen more

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 8.75 to MP 9.00 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Cosley (date) 09-Sept-2010 Enbridge

Signature Gary A Andis (date) 9.9.10 EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBETIS (date) 9/11/10 Enbridge

Signature WILLIAM J BATES (date) 9/11/10 EPA

Signature ERNEST SARKISIATO (date) 9/11/10 MDNRE

5. **EPA**

Signature Christal Wagner (date) 9/19/10 EPA Division Supervisor

Inspected 9/19/10 - Maintain boom @ Island at RDB 8.75 MP marker
Maintain boom at LDB 9.0 MP.

Appendix E
Photos



Photo 0285 – Looking southwest at left descending bank. Near EPA-C-0152.



Photo 0286 – Looking south at island. Near EPA-C-0151 & EPA-C-0154.



Photo 0287 – Looking northwest at left descending bank. Near EPA-C-0017.



Photo 0288 – Looking northwest at left descending bank.

Field Photo Log – Segment MP 9.00



Photo 0289 – Looking southeast at left descending bank. Near PO-C-0001.



Photo 0309 – Looking north at right descending bank. Near EPA-C-0016.

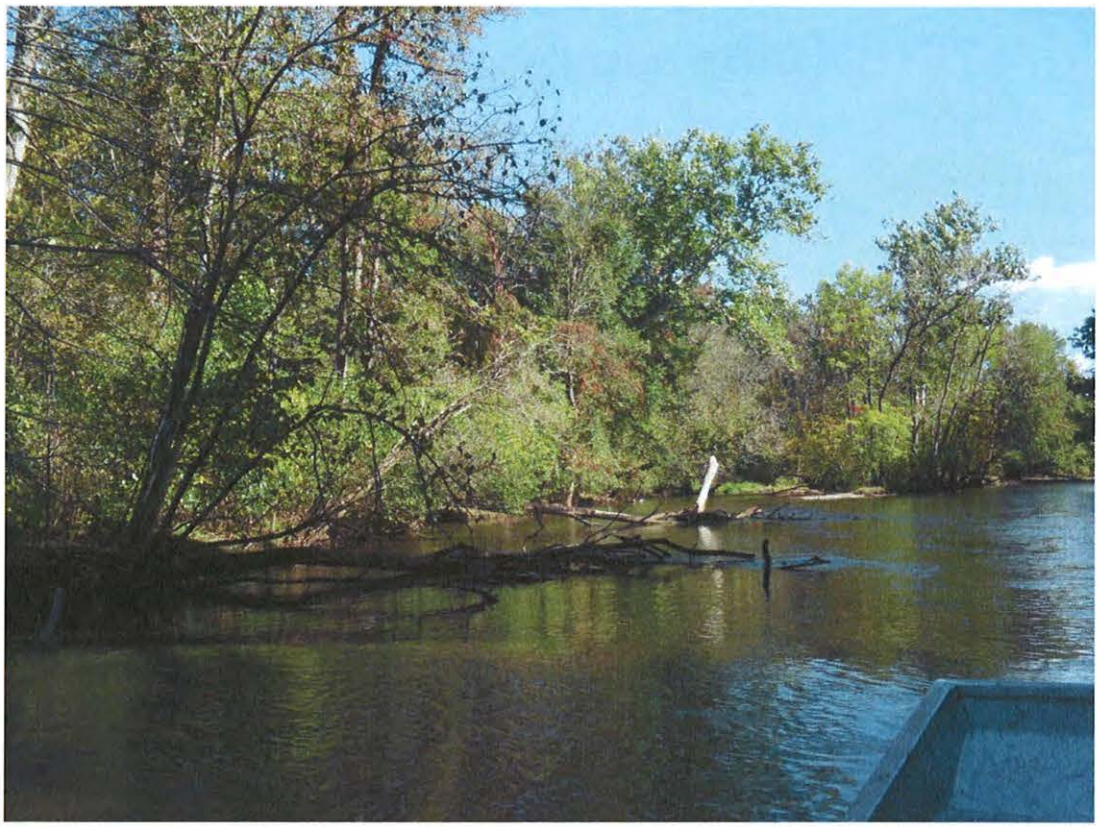


Photo 0310 – Looking north at right descending bank. Near SCC2-3.

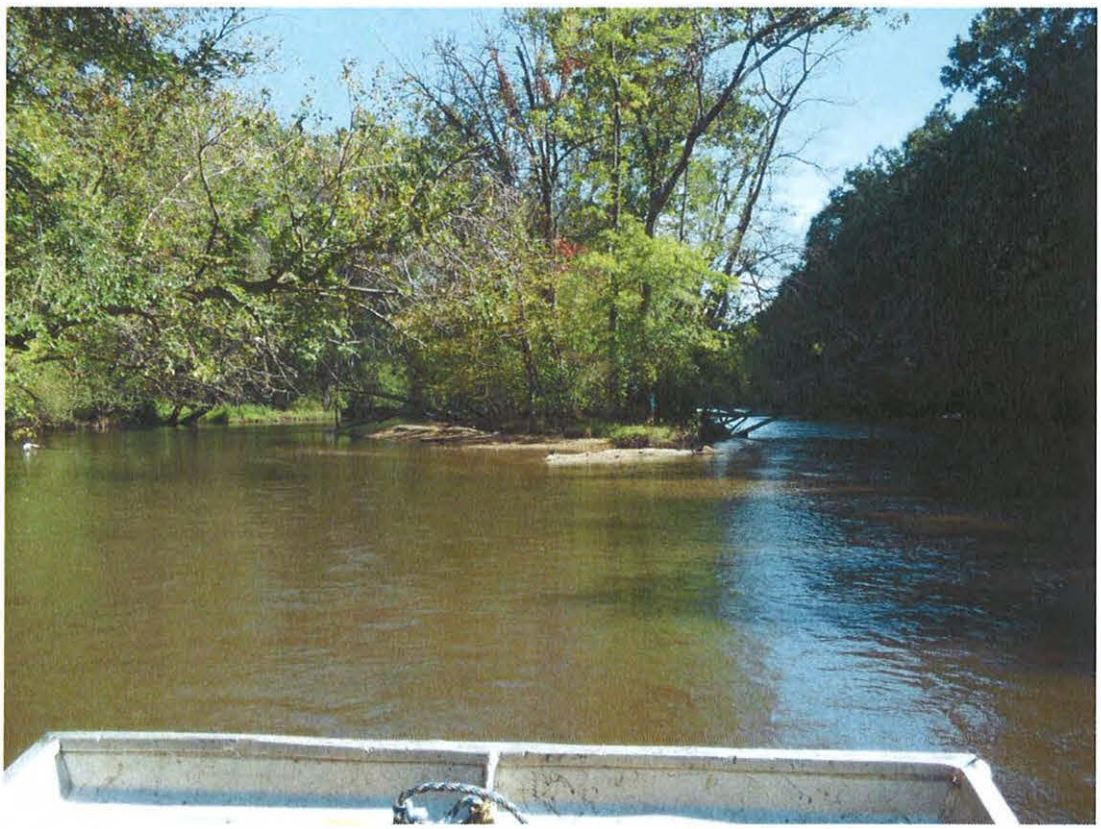


Photo 0311 – Looking southeast at island. Near EPA-C-0155.



Photo 0312 – Looking northwest at island. Near EPA-C-0153.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 9.25 – MP 9.00 to 9.25

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 9.25 had very light to light oiling on the left descending bank and light oiling on the right descending bank with oil in the flood plain. The overbank areas contained no areas of oil requiring clean-up. The island in the segment had several areas of pooled oil in its interior. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 9.25 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact.
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain

- Oiled woody vegetation remains on right descending bank near MPs 9.00 and 9.25 respectively.
- Oiled woody vegetation remains on left descending bank near EPA-C-0019 .
- Some oiled debris remains in place on left descending bank near MP 9.25 and EPA-C-0019

Segment 9.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incide...-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 9-9.25 Left Bank While Looking Downstream									
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 9-9.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

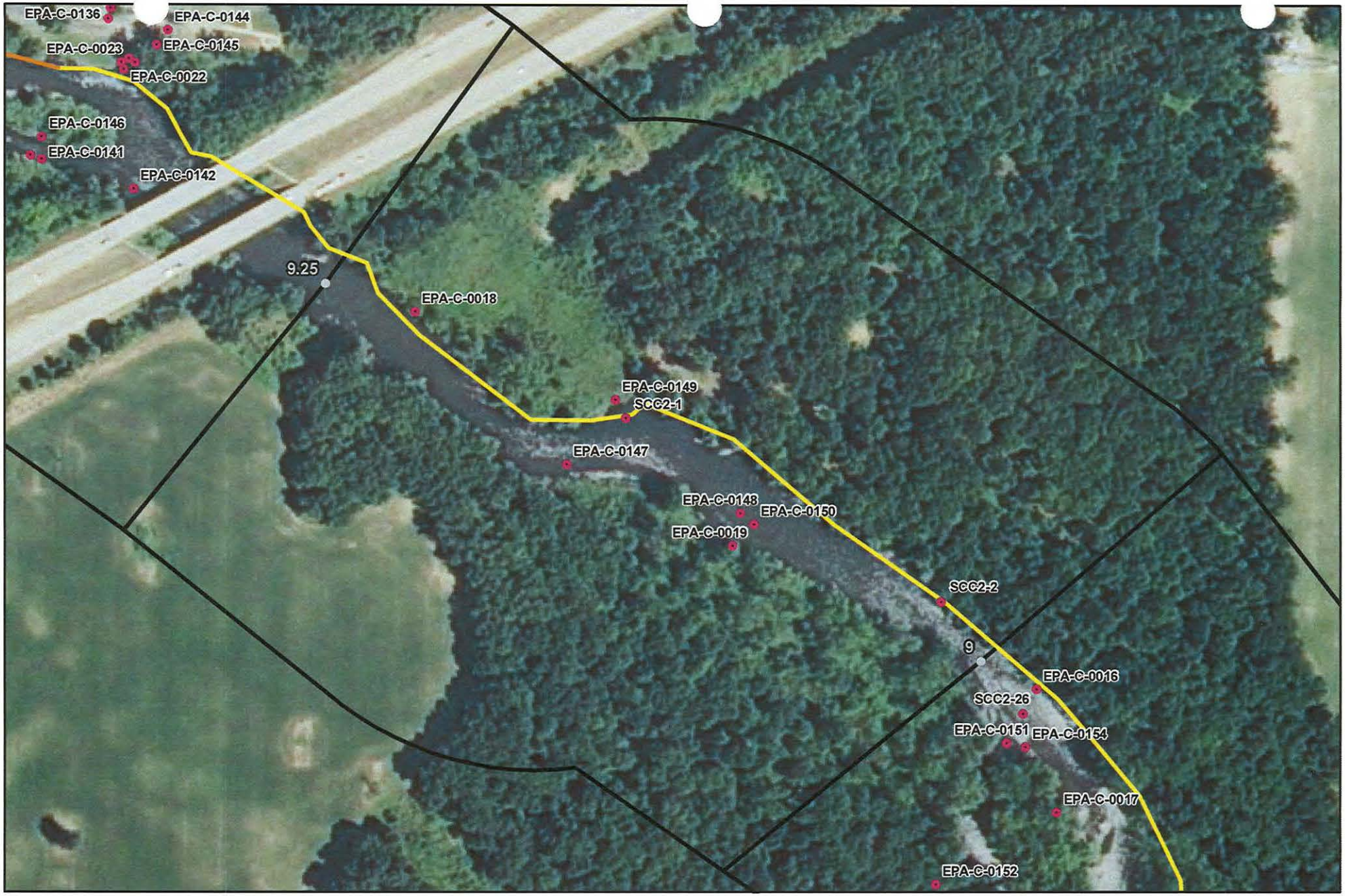
ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incide. .-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 9-9.25 Right Bank While Looking Downstream									
SCC2-1	Shoreline	Shoreline Assessment 8/6/2010	•		•		Skim ops ongoing. Flood plain oiled approximately 10 ft. into bank. Brush cutters needed. High volume flush.	42.288533	-85.111483
SCC2-2	Shoreline					•	Need boom. Vegetation weeping oil back into wetland. Heavily oiling *pooled oil*. South side of river across from C3. Interior of island has several pools of oil approx 8x20, 3x6 & several small pools.	42.287700	-85.109517
EPA-C-0149	Main Channel	SCAT-T2 8/18/2010					No photos - dense vegetation. CT on bottom of vegetation.	42.28862	-85.11156
EPA-C-0150	Main Channel	SCAT-T2 8/18/2010					Crews trimming vegetation. Photo #11.	42.28805	-85.11068
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 9-9.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/7/10 **Time: AM / PM** ~~0800~~ 1700 HRS

Operations Division: C **Segment ID: From** 9 **Start MP to End MP** 9.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: (Sun)/Cloud/Rain/Snow/ SUN

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 09 07 10 Time: AM / PM 1700

Operations Division: C Segment ID: From 9 Start MP to End MP 9.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Chel Vie

Division Supervisor(Contractor): Arnold Phillips

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9-9.25 Left Bank While Looking Downstream										

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names:

Date:

Comments:

A stake was noted on the LPB, and was labled EPA-C-0148, EPA-C-147, EPA-C-0019. NO oiled areas - SCAT satisfactory

9/10/10

Team 2

Amanda Bohnenblust

Howard Phram

James Sallee

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9-9.25 Right Bank While Looking Downstream										
SCC2-1	Shoreline	Shoreline Assessment 8/6/2010	•		•	Skim ops ongoing. Flood plain oiled approximately 10 ft. into bank. Brush cutters needed. High volume flush.		42.288533	-85.111483	Y N
SCC2-2	Shoreline		Need boom. Vegetation weeping oil back into wetland. Heavily oiling *pooled oil*. South side of river across from C3. Interior of island has several pools of oil approx 8x20, 3x6 & several small pools.					42.287700	-85.109517	Y / N
EPA-C-0149	Main Channel	SCAT-T2 8/18/2010			No photos - dense vegetation. CT on bottom of vegetation.			42.28862	-85.11156	Y N
EPA-C-0150	Main Channel	SCAT-T2 8/18/2010				Crews trimming vegetation. Photo #11.		42.28805	-85.11068	Y / N
EPA-C-0018			No comments or recommendations					42.28902	-85.11280	Y / N
EPA-C-0147			No comments or recommendations					42.28832	-85.11185	Y / N

Printed Team Members Names: HOWARD PHAM, EPA
Date: 9/10/10.
Comments: Amarda Bohnebluet, Enbul Team 2
James Sallee, MDNRE

- Pink flag (no marking on flag) is located on left bank - ~~across from~~ SCC2-2 - Not know what flag is for
- Description at SCC2-2 is not correct. It has a high bank and a stream water ~~[illegible]~~ on
- removed a few pieces of large woody oiled debris + small amounts of oiled vegetation

not actual zones

no oil. per discussion w/ Chris Burns the description was incorrect. So we were supposed to go w/what we saw in the field

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 9.00 to MP 9.25 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Cooley 09-Sept-2010 (date) Enbridge

Signature Gary A Anderson 9.9.10 (date) EPA

4. **SCAT Reassessment**

Signature Amanda Bohnenblust 9/10/10 (date) Enbridge

Signature HOWARD PHAM 9/10/10. (date) EPA

Signature James Soller 9/10/10 (date) MDNRE

5. **EPA**

Signature 9/19/10 (date) EPA Division Supervisor

Inspected 9/19 1045 am

Refer to Technical Services to evaluate whether hard boom upstream of bridge is still necessary CW

Appendix E
Photos



Photo 0279 – Looking southeast at left descending bank.

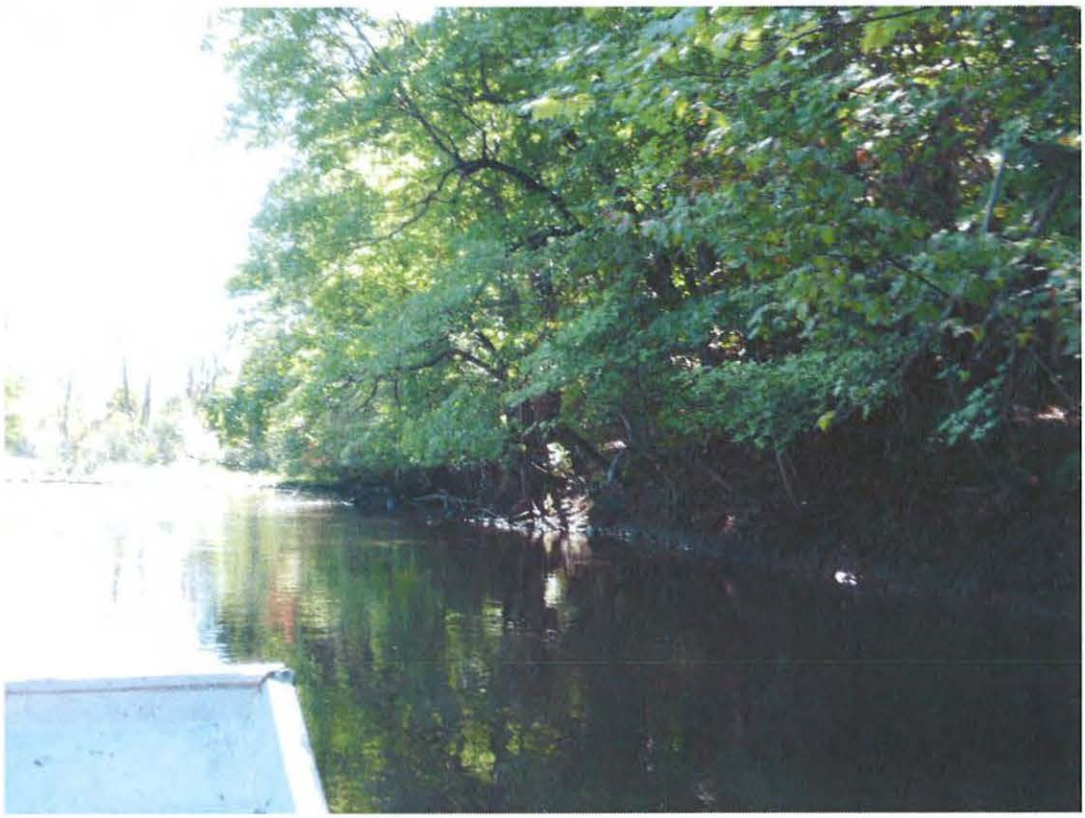


Photo 0280 – Looking southeast at left descending bank.



Photo 0281 – Looking east at left descending bank. Near EPA-C-0147.



Photo 0282 – Looking south at left descending bank. Near EPA-C-0148 & EPA-C-0019.

Field Photo Log – Segment MP 9.25



Photo 0284 – Looking southeast at left descending bank.



Photo 0332 – Looking southeast at right descending bank. Near EPA-C-0018.

Field Photo Log – Segment MP 9.25



Photo 0333 – Looking southwest at right descending bank. Near EPA-C-0149 & SCC2-1.



Photo 0334 – Looking southeast at right descending bank. Near SCC2-2.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 9.50 – MP 9.25 to 9.50

Enbridge Energy

September 18, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 9.50 had very light to moderate oiling and areas of pooled oil on the left descending bank. The island present had pooled oil in the interior of the island. The river's right descending bank had moderate to light oiling and oiled vegetation. The left and right overbanks contained no areas requiring clean-up.

Actions

Free oil was recovered from the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 9.50 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- High volume, low pressure flushing for free oil removal with downstream booming, absorbent booms and pads;
- Removal of oiled debris;
- Removal of overhanging vegetation;
- High pressure flushing of man-made structures and/or rocks;
- Removal of pooled oil.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody vegetation on left and right descending bank (near South Wattles Road and EPA-C-0140) and on the island near EPA-C-0146;
- Oiled soil on left descending bank near EPA-C-0140 and on island;

- Oiled rock/cobble on the right descending bank just upstream of EPA-C-0023;
- Oiled man-made structure (bridge pier) on the left and right descending bank at I-94 and South Wattles Road bridges. Oiled concrete remains near EPA-C-0140.

The left descending bank, west of the island, has the potential to require operation and maintenance. Recommended operation and maintenance is the installation of absorbents and booming strategy as necessary.

Segment 9.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

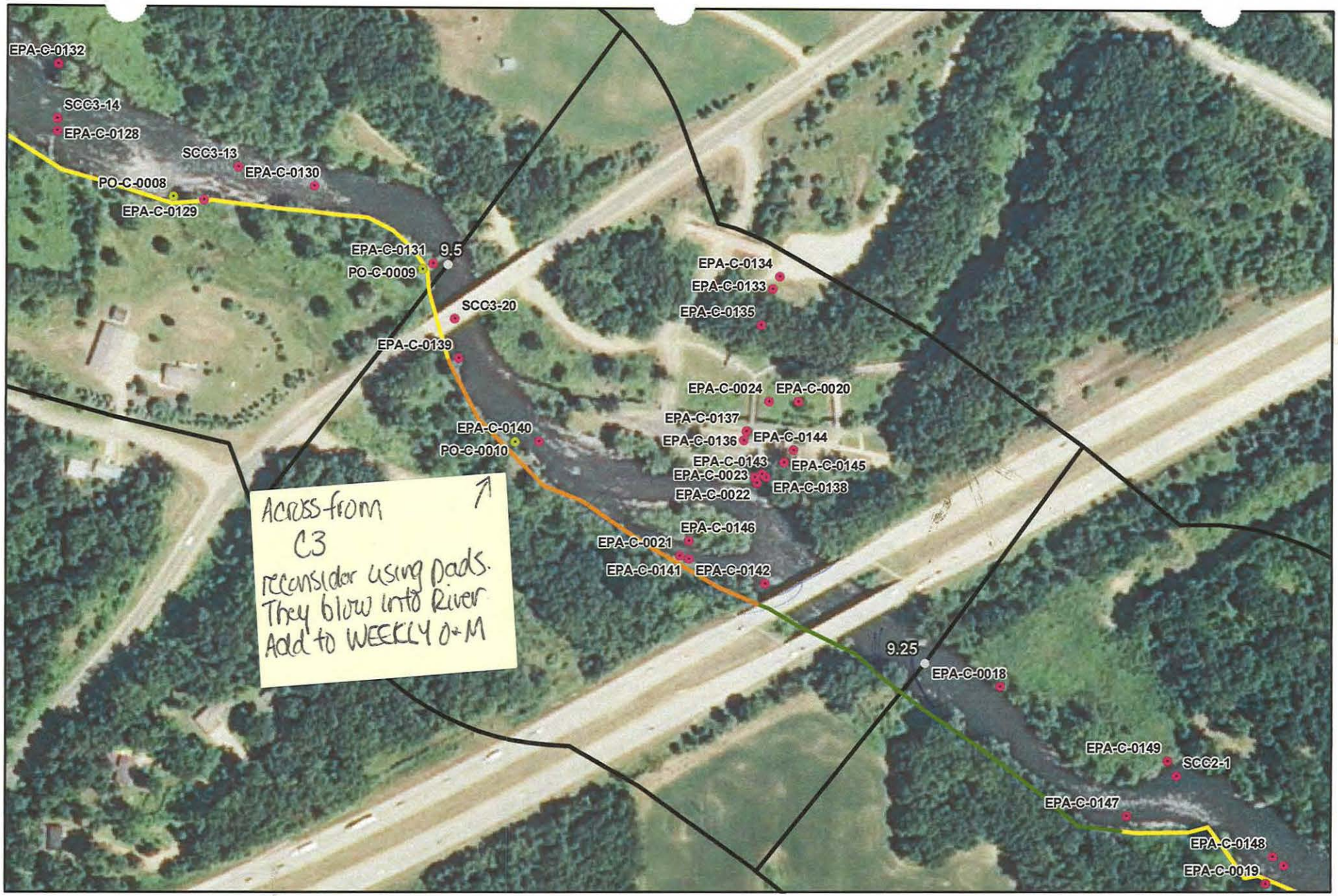
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 9.25-9.5 Left Bank While Looking Downstream									
PO-C-0010	Main Channel	Pooled Oil Obriens 8/18/10					Pooled oil observed.	42.29033	-85.11641
EPA-C-0141	Main Channel	SCAT-T2 8/17/2010		●			Intermittent.	42.28969	-85.11512
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 9.25-9.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

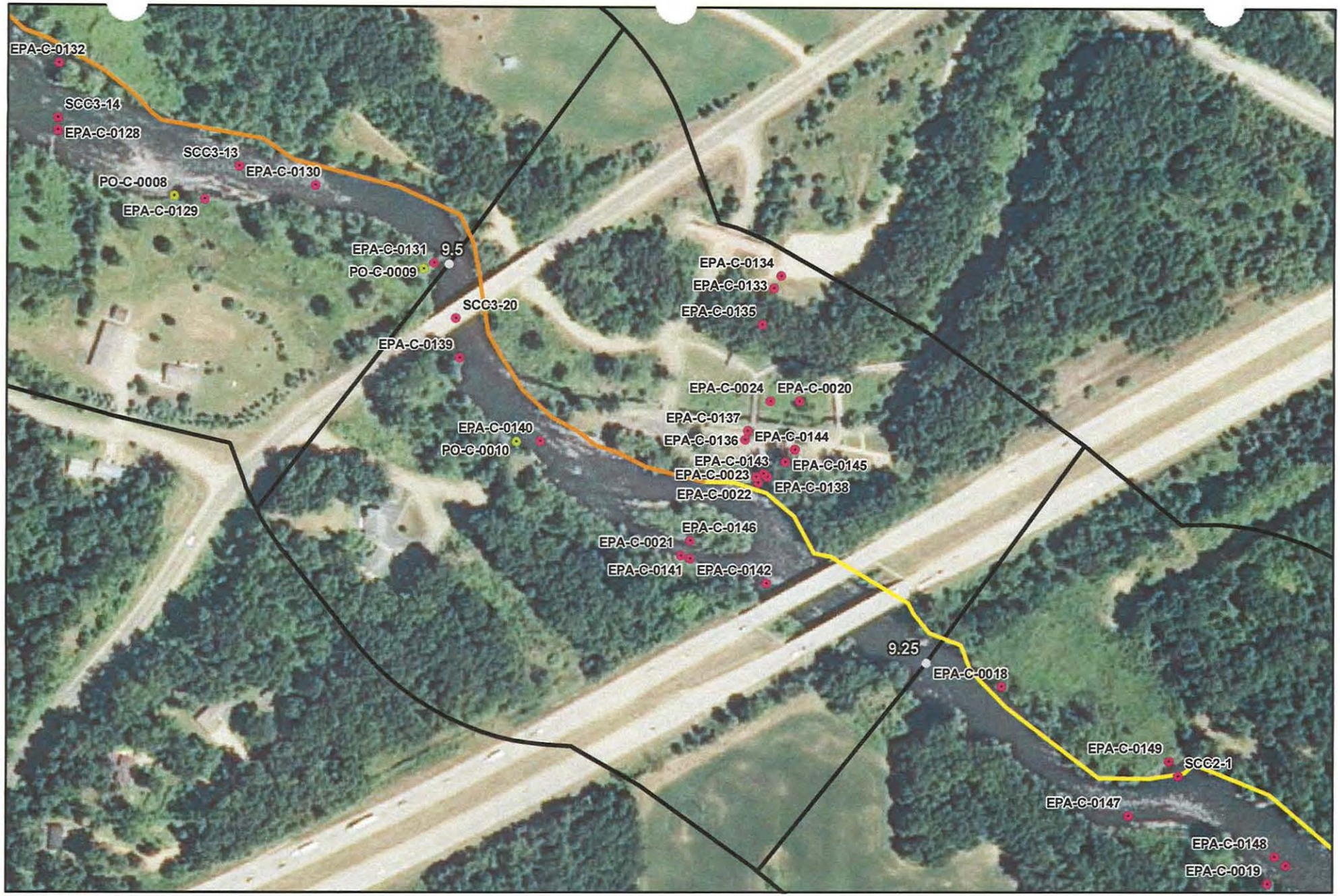
ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 9.25-9.5 Right Bank While Looking Downstream									
SCC3-20	Shoreline	Shoreline Assessment 8/6/2010	●		●	●	Cut and flush to historic bridge. Skim ops high volume flush.	42.29100	-85.11687
EPA-C-0146	Main/Side Channel	SCAT-T2 8/18/2010		●			Photo #8-10. Several small areas of pooled oil, interior of island.	42.28981	-85.11511
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 9.25-9.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 8/03/10 **Time: AM / PM** 1300

Operations Division: C **Segment ID: From** 9.75 **Start MP to End MP** 9.5 **Segment Length: 0.25 mile**

Bank: (LDB / RDB) ☑ **Island** **Overbank: LOB/ROB**

Weather: Sun/(Cloud)/Rain/Snow/ CLOUDY

Field Inspection Team

Enbridge Inspector: JOE MANELLA

Division Supervisor(Contractor): Arnold Phillips

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090810 Time: AM / PM 1730

Operations Division: C Segment ID: From 9.75 Start MP to End MP 9.5 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/ Cloudy

Field Inspection Team

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): Arnold Phillips

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work completed

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9.25-9.5 Right Bank While Looking Downstream										
SCC3-20	Shoreline	Shoreline Assessment 8/6/2010	•		•	•	Cut and flush to historic bridge. Skim ops high volume flush.	42.29100	-85.11687	(Y) / N
On island across from C30 EPA-C-0146	Main/Side Channel	SCAT-T2 8/18/2010		•			Photo #8-10. Several small areas of pooled oil, interior of island.	42.28981	-85.11511	(Y) / (N) PR

↳ Still contained oil so I called Doug at 12:00; a hornets nest that was hanging above vegetation that needed to be removed was removed and Doug Dehr was called at 9:37 A.M and I left a message Talked to Doug at 10:45 A.M. he said that he would send a hot shot team. 9/14/10 - Rodney & Dave (Hot Shot) cleaned this ar

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names:

Date:

Comments:

EPA-C-0136 (42.29035 -85.114717) (Y) / N
EPA-C-0137 (42.2904 -85.1147) (Y) / N
EPA-C-0138 (42.29015 -85.11455) (Y) / N
EPA-C-0143 (42.290167 -85.114583) (Y) / N
EPA-C-0144 (42.2903 -85.11435) (Y) / N
EPA-C-00145 (42.290233 -85.114417) (Y) / N
EPA-C-0020 (42.290567 -85.114317) (Y) / N
EPA-C-0022 (42.290117 -85.114617) (Y) / N
EPA-C-0023 (42.29015 -85.114633) (Y) / N
EPA-C-0024 (42.290567 -85.114533) (Y) / N
EPA-C-0133 (42.291183 -85.114517) (Y) / N
EPA-C-0134 (42.29125 -85.114467) (Y) / N
EPA - C-135 (42.290983 -85.1146) (Y) / N

9/14 Team 2
Pamela Rice Enbridge/Inc
ROSS DEL ROSARIO USEPA
called Chris to make contact w/original SCAT team to see w they saw at No park. They did not remember seeing al. & we sa no signs. walked area & cleaned all sides
after
thoroughly walking the area.

..... are located on the map with no recommendations and were collected during EPA SCAT, please refer to Kalamazoo Enbridge Oil Spill Recommendations (missing Recommendations)

9/10/10 Team 2
Amanda Bihrenbles
James Sulek
Edward Ahern

9/11/10 Team 3
Pamela Rice
Ken Mraczkowski
Eugene Dennis

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9.25-9.5 Left Bank While Looking Downstream										
PO-C-0010	Main Channel	Pooled Oil Obriens 8/18/10					Pooled oil observed.	42.29033	-85.11641	(Y) / N
EPA-C-0141	Main Channel	SCAT-T2 8/17/2010		•			Intermittent.	42.28969	-85.11512	(Y) / N

↳ still pooled oil, oiled veg/bm called Doug 9/14 still oiled debris; Railroad will clean + we will reassess + Reassess see comments below

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: 9/14/10 TEAM 1 MEMBERS: ROSS DEL ROSARIO, USEPA; Pamela Rice, Enbridge/NRC; Dana Strouse (MDNRE)

Date:

Comments:

EPA-C-0139 SCAT T2 (8/19) No comments Reassess per Kalamazoo Enbridge Oil Spill Cleanup Recommendations
42.290783 -85.116833 (Y) / N ~~not active~~ area still contains oiled vegetation/soil. River bank per Lisa Sullivans direction - Rail road ~~will be~~ to be cleaned up by railroad during recovery clean up

✓ EPA-C-0140 SCAT T2 (8/19) Concrete Stained on bridge piling, no recommendations 42.290333 -85.116233 (Y) / N - not a zone

✓ EPA-C-0141 SCAT T2 (8/19) Pooled oil on shore with intermittent pools located in the vicinity, Remove pooled oil
42.2897 -85.115117 (Y) / N - could not find specific area - but in vicinity of EPA-C-0021 - area is clean. No oil observed.

✓ EPA-C-142 SCAT T2 (8/19) I-94 Bridge Abutment, no recommendations, reference point only - no zone, SCAT signs ~~no~~ (Y) / N

✓ EPA-C-0021 SCAT T2 (8/19) No recommendations Reassess per Kalamazoo Enbridge Oil Spill Cleanup Recommendations - ~~active~~ (Y)
42.290783 -85.116833 (Y) / N (Recommedations missing) No oil observed; appears oiled vegetation ~~SCAT sign~~ ~~no~~ and debris was removed. Note some woody plant material larger than 2" was removed. (Y) / N

PC-C-0010 - multiple holes in shoreline/bank w/ stained/coated sediment. Also several areas along shoreline w/ stained/coated sediment debris will need to be addressed w/ Phase 2 area extends upstream to Island.

EPA-C-0131 and PO-C-0009 are on MP 9.75 recommendation sheet and mapped in segment MP 9.75 but actual site is in segment 9.5 appears that oily vegetation has been removed - no recommendations

Team 2 9/10/10
Amanda Bonnenbleed
Howard Phron
James Soler

9/14 An area was observed just West of the island along the LOB where the mucky soils were saturated with oil. The hot shot team was called and sorbent pads were applied. AREA will need to be addressed by secondary clean up operations. Sorbent pads were replaced late afternoon Way point - N42.29006 ; W-85.11602

9/14/10

Additional pooled oil and small tar balls were observed when the pads were removed and replaced. Back at the Incident Command Post, Team 1 had a brief meeting with Ann Whelan (USEPA), Jeff Benefield (Enbridge Scat Coord.), and Joe McGaver to discuss how to handle this area. It was determined that this area would be considered as an O&M and that the absorbent pads and an absorbent boom needs to be maintained in this area. Arnold (Hot Spot Supervisor) was called an asked to place an absorbent boom around this a-

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ **Segment ID: From MP** 9.25 **to MP** 9.50 **Segment Length: 0.25 mile**

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley 09-Sept-2010 (date) Enbridge

Signature Gary Andrew 9.9.10 (date) EPA

4. **SCAT Reassessment**

Signature Pamela E. Rice 9/14/10 (date) Enbridge

Signature ROSS DELROSARIO 9/14/10 (date) EPA

Signature Dana Stroosie 9/14/10 (date) MDNRE

5. **EPA**

Signature 9/20/10 (date) EPA Division Supervisor

Refer to Technical Services boom upstream of ~~Wells Road~~ I-94? bridge just
Containment boom @ C3 needs to be netted out. Remove snare. Include in WEEKLY O+M
- Continue WEEKLY O+M of area across from Staging C3. Reconsider strategy of leaving pads in place. Pads just blow into the water - then need to be picked up CW.

Appendix E
Photographs



Photo 0349 – Looking southwest at left descending bank, near SCC3-20.



Photo 0350 – Looking northwest at left descending bank, near EPA-C-0139.



Photo 0351 – Looking northeast at left descending bank, near EPA-C-0140 and PC-C-0010.



Photo 0352 – Looking southeast at island. Near EPA-C-0146.



Photo 0353 – Looking southeast at left descending bank, near EPA-C-0021 and EPA-C-0141.

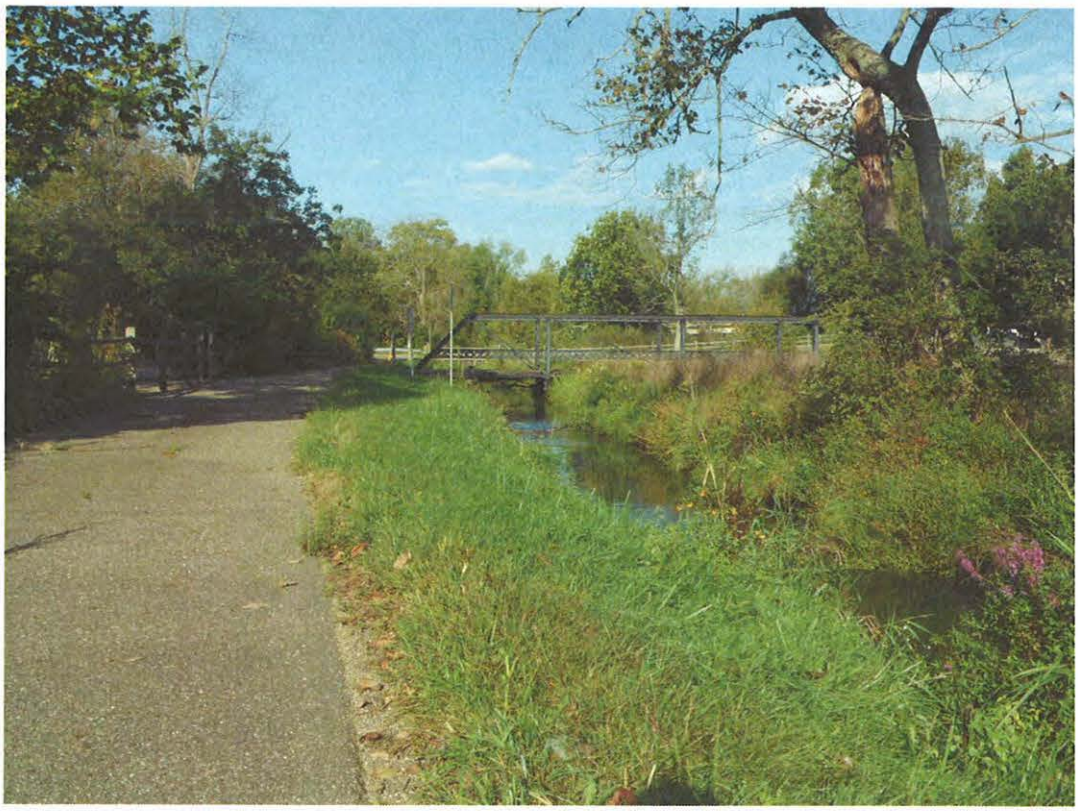


Photo 0354 – Looking west at right descending bank (overbank), near EPA-C-0020 and EPA-C-0024.



Photo 0355 – Looking southeast at right descending bank.



Photo 0356 – Looking south at island, near EPA-C-0146.



Photo 0357 – Looking southwest at left descending bank, near EPA-C-0021 and EPA-C-0141.

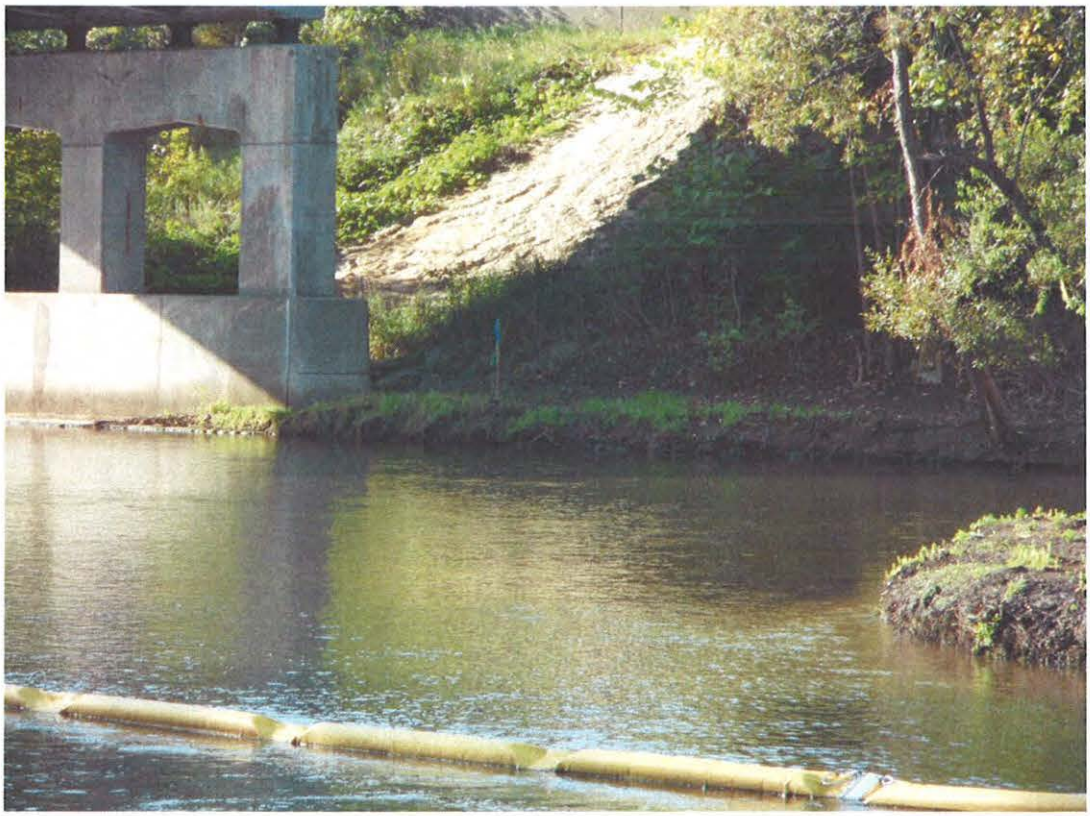


Photo 0358 – Looking south at left descending bank, near EPA-C-0142.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 9.75 – MP 9.50 to 9.75

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 9.75 had light oiling including pooled oil on the left descending bank and moderate oiling on the right descending bank. The right descending bank also had some areas of pooled oil and oiled debris. The island shoreline had oiled debris accumulations on the west end. The overbank areas contained no oil requiring clean-up. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 9.75 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact.
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Piles of oiled branches and debris on west end of island
- Oiled logs on central portion of island
- Oiled woody vegetation on left and right banks of downstream half of segment.

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 9.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Docnmentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

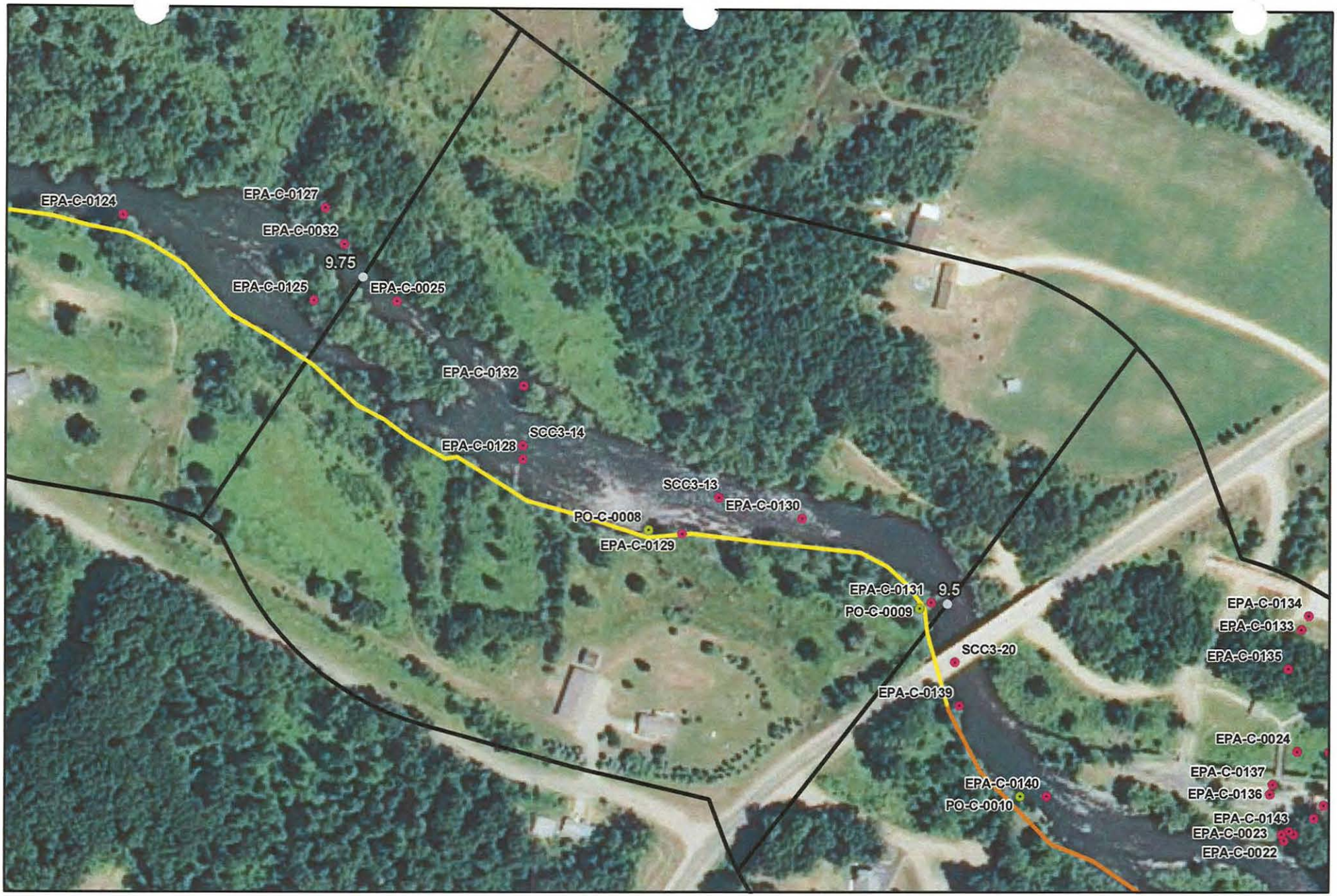
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incide...-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 9.5-9.75 Left Bank While Looking Downstream									
SCC3-13	Shoreline		●		●	●	High volume flush.	42.29182	-85.11848
PO-C-0008	Main Channel	Pooled Oil Obriens 8/18/10					Pooled oil observed.	42.29165	-85.11896
PO-C-0009	Main Channel	Pooled Oil Obriens 8/18/10					Pooled oil observed.	42.29127	-85.11711
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 9.5-9.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

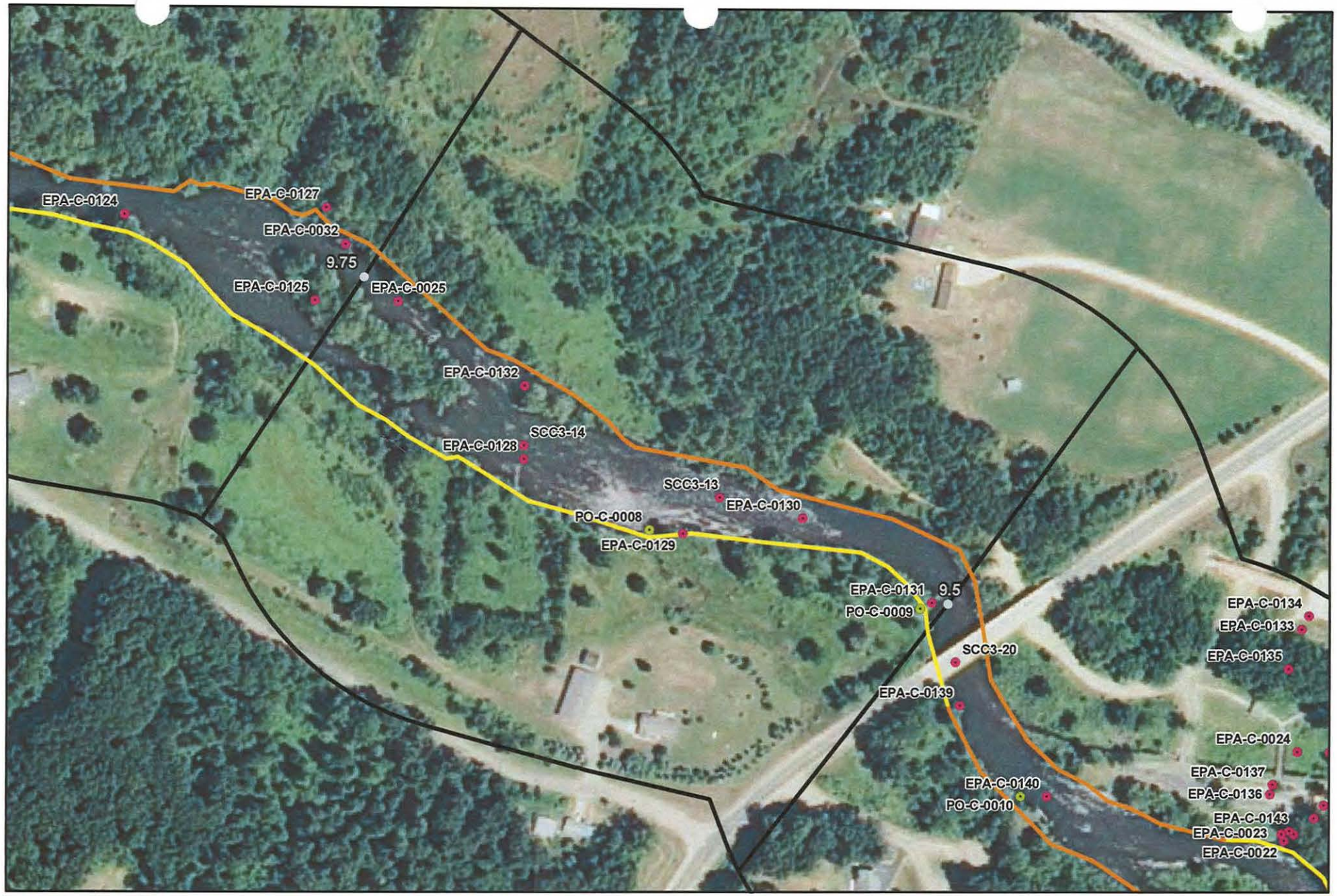
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incid -Kalamazoo River Oil Spill

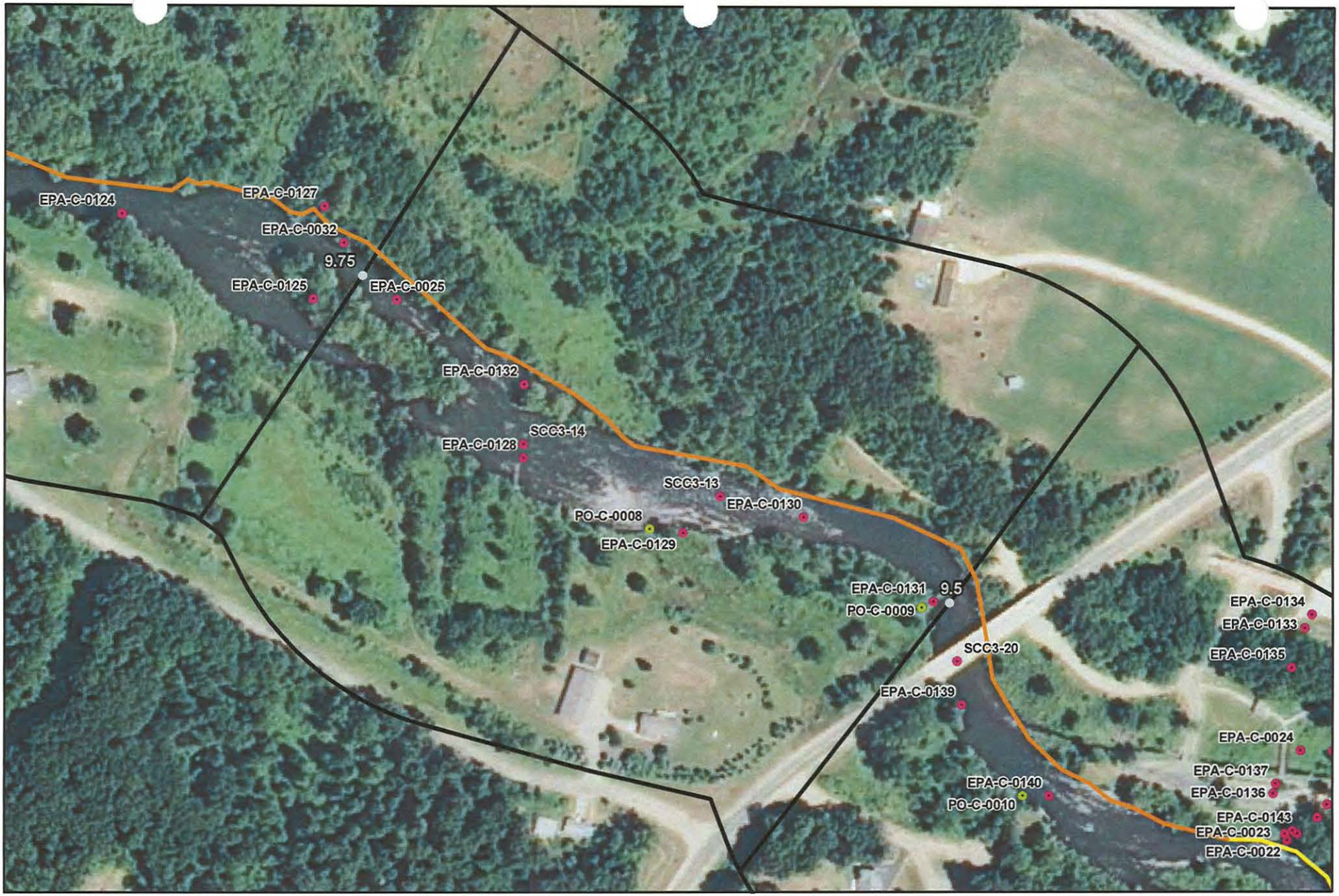
OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 9.5-9.75 Island									
EPA-C-0025	Island	SCAT-T1 8/15/2010					Based on location and position of oil. Believe east end of island has oil in	42.292783	-85.120683
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									


EPA-C-0124
EPA-C-0127
EPA-C-0032
9.75
EPA-C-0125
EPA-C-0025
EPA-C-0132
SCC3-14
EPA-C-0128
SCC3-13
EPA-C-0130
PO-C-0008
EPA-C-0129
EPA-C-0131
9.5
PO-C-0009
EPA-C-0134
EPA-C-0133
SCC3-20
EPA-C-0135
EPA-C-0139
EPA-C-0024
EPA-C-0137
EPA-C-0140
EPA-C-0136
PO-C-0010
EPA-C-0143
EPA-C-0023
EPA-C-0022
Springfield
Battle Creek
Marshall
CALHOUN
River Quarter Miles
Operational Focus Area
Pooled Oil
Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
Division C: Mile Marker 9.5-9.75 Island
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill
0 75 150
Feet
Source: Aerial Photography: USDA, 2009.
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 9.5-9.75 Right Bank While Looking Downstream									
SCC3-14	Shoreline		●	●		●	High volume flush to snare boom. Debris field has small amount of pooled oil.	42.29207	-85.11982
EPA-C-0132	Main/Side Channel	SCAT-T2 8/18/2010		●			Photo #6-7. Recommend boom placement. Oiled frogs seen several small areas	42.29236	-85.11982
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 9.5-9.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 09/08/10 Time: AM / PM 1400

Operations Division: C Segment ID: From 9.5 Start MP to End MP 9.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ CLOUD

Field Inspection Team

Enbridge Inspector: JOE MANELL

Division Supervisor(Contractor): Arnold Phillips

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090810 **Time: AM / PM** 1430

Operations Division: C **Segment ID: From** 9.5 **Start MP to End MP** 9.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Cloudy

Field Inspection Team

Enbridge Inspector: Chad Via

Division Supervisor(Contractor): Arnold Phillips

SCAT Reviewed – Description of Clean Up Required

Reviewed all items reviewed by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work completed

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9.5-9.75 Left Bank While Looking Downstream										
SCC3-13	Shoreline		•		•	•	High volume flush.	42.29182	-85.11848	(Y) / N
PO-C-0008	Main Channel	Pooled Oil Obriens 8/18/10					Pooled oil observed.	42.29165	-85.11896	(Y) / N
PO-C-0009	Main Channel	Pooled Oil Obriens 8/18/10					Pooled oil observed.	42.29127	-85.11711	(Y) N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: Pamela Rice, Enbridge/NRC; Eugene Dennis, US EPA OSC; Kenneth M. Mraczkowski, MDNRE

Date: 9/11/10

Comments:

EPA-C-0128 SCAT T2 (8/19) Coated woody debris and tar covered Recommendation remove woody debris
42.292 -85.119817 (Y) / N
EPA-C-0129 SCAT T2 (8/19) Coated and tar covered Recommendation to remove tar covered vegetation
42.291633 -85.118733 (Y) / N
EPA-C-0131 SCAT T2 (8/19) Covered and tar covered Recommendation to remove tar covered vegatation
42.2913 -85.117033 (Y) / N

No Recommendations For Above Locations, Please refer to the Kalamazoo Enbridge Oil Cleanup Methods

ID Point SCC3-14 is located on the left bank, but is listed on the right bank sheet. SEE sign off on right bank sheet.

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9.5-9.75 Right Bank While Looking Downstream										
Point is located on left bank SCC3-14	Shoreline		•	•		•	High volume flush to snare boom. Debris field has small amount of pooled oil.	42.29207	-85.11982	(Y) / N
This point is located on an island EPA-C-0132	Main/Side Channel	SCAT-T2 8/18/2010		•			Photo #6-7. Recommend boom placement. Oiled frogs seen several small areas pooled oil and (15m x 2m) larger area.	42.29236	-85.11982	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: Pamela Rice/Enbridge/NRC; Eugene Dennis, USEPA - Eugene Dennis

Date: 9/11/10

Comments: ~~Kenneth Mrazkowski/MDNRE~~ Kenneth M. Mrazkowski

EPA-C-0132 SCAT T2 (8/19) No recommendations, please refer to Kalamazoo Enbridge Oil Cleanup Methods
42.292367 -85.119817 (Y) / N

- Observed 2 medium size piles of oiled branches and debris on the west end of the island. There is a small pile of oiled logs in the central portion of the island and east end,

ID EPA-C-0130 is located on the right bank, not an island; Area cleared by Team 3 see island sheet.

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9.5-9.75 Island										
This point is EPA-C-0025 located on the right bank	Island	SCAT-T1 8/15/2010					Based on location and position of oil. Believe east end of island has oil in interior.	42.292783	-85.120683	(Y) N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: Pamela Rice, Enbridge/NRC; Eugene Dennis, USCG OSC; Kenneth M. Mroczkowski MDNRE

Date: 9-11-10

Comments:

EPA-C-0130 SCAT T2 (8/19) coated tar covered vegetation, riprap that is stained with surface oil residue. Please refer to Kalamazoo Enbridge Oil Cleanup Methods 42.291717 -85.117917 (Y) N

- This ID point is located on the right bank.

ID Point EPA-C-0132 is located on an island, but was placed on Right bank sheet. See Right bank sheet for assessment sign off and observations.

ID Point EPA-C-0125 is located on the west end of the island that is located approx. at m.p. 9.75

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION **Operations Division:_____ Segment ID: From** 9.50 **Start MP to End MP** 9.75 **Segment Length: 0.25 mile**

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

[signature] 11-Sept-2010. Enbridge
Signature Ken Costley (date)

[signature] 9-10-2010 EPA
Signature Eugene Dennis (date)

4. **SCAT Reassessment**

Pamela E. Rice 9/11/10 Enbridge
Signature Pamela E. RICE (date)

[signature] 9-11-2010 EPA
Signature Eugene Dennis (date)

[signature] 09/11/2010 MDNRE
Signature Kenneth M. Mroczkowski (date)

5. **EPA**

[signature] 9/20/10 EPA Division Supervisor
Signature (date)

~~Sheen @ upper end of island - end in tree root hole. Also pads in hole. Called C Hauxe. Hot shot will get it.~~

↑ comments for different segment

Sorry

APPROVED - NO comments
CW 9/20/10
1830 hrs

Revised 8/29/10

Appendix E
Photos



Photo 0269 – Looking northeast at right descending bank. Near EPA-C-0025.



Photo 0270 – Looking east at side channel. Near EPA-C-0132.



Photo 0271 – Looking east at island. Near EPA-C-0132.



Photo 0272 – Looking west at island.

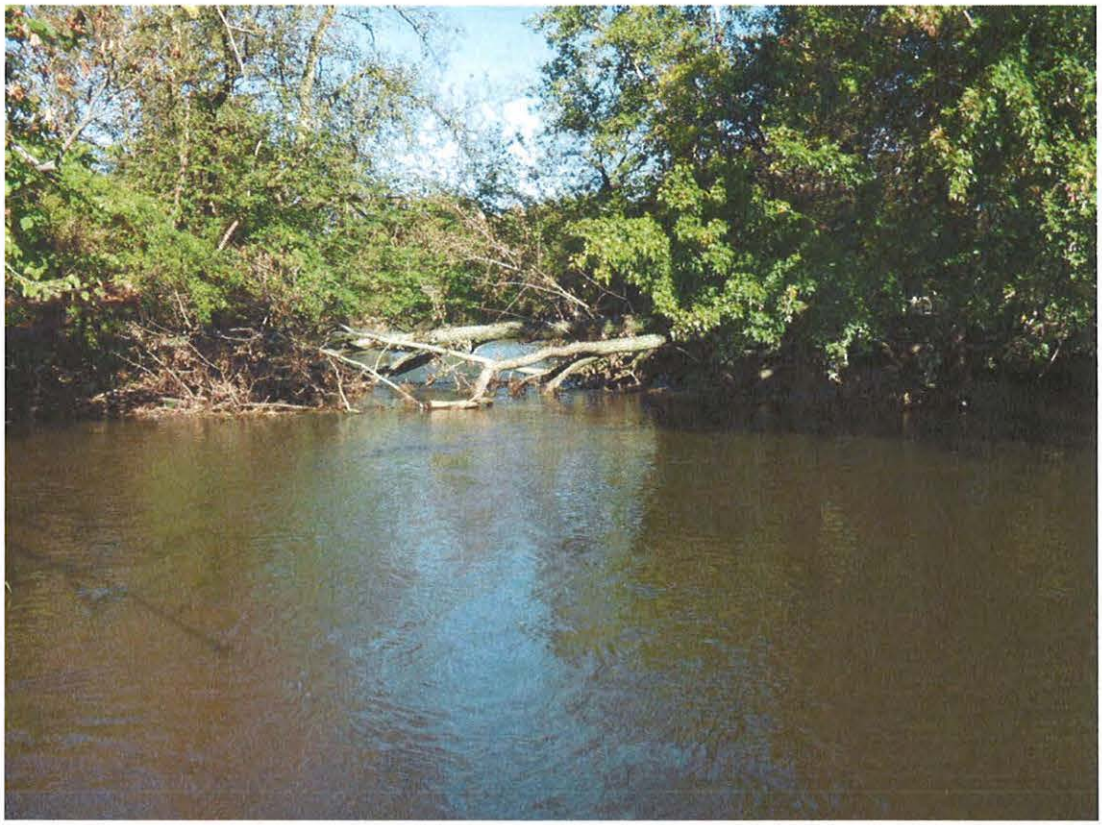


Photo 0273 – Looking northwest at island.

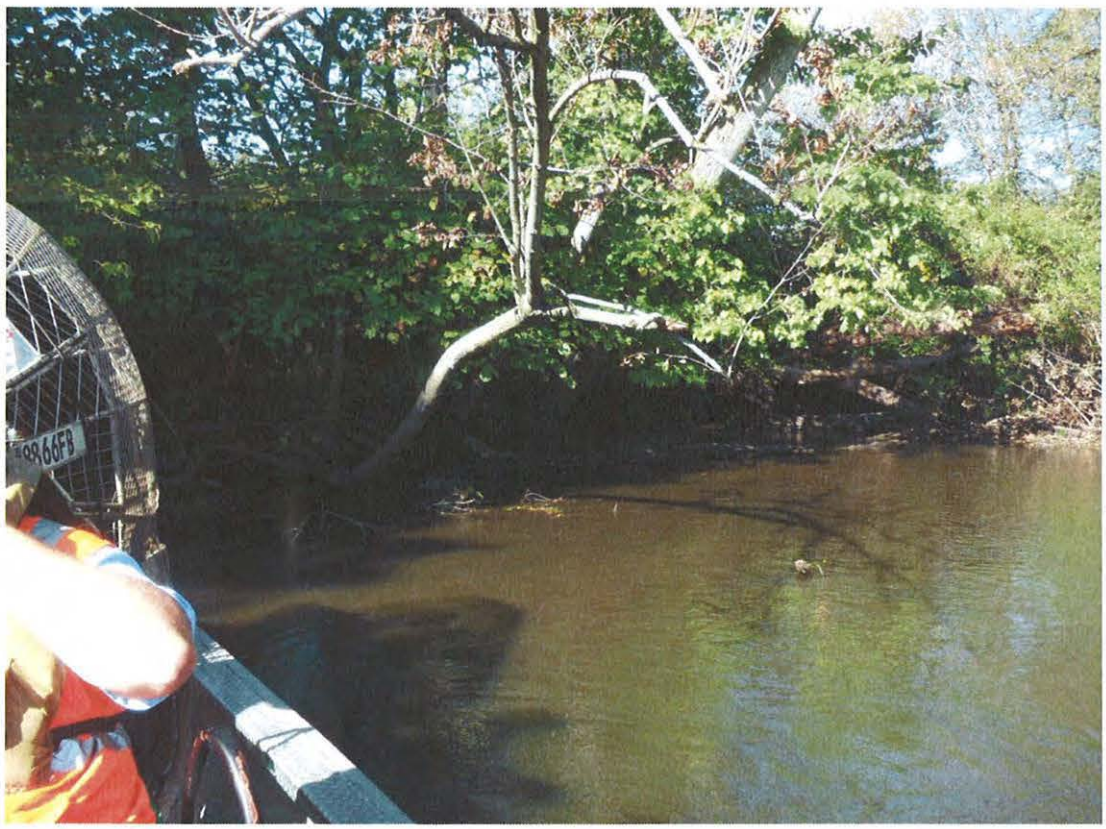


Photo 0274 – Looking southwest at left descending bank.



Photo 0275 – Looking southwest at left descending bank. Near EPA-C-0128 & SCC3-14.



Photo 0276 – Looking east at left descending bank. Near PO-C-0008.

Field Photo Log – Segment MP 9.75



Photo 0277 – Looking southeast at left descending bank. Near EPA-C-0129.



Photo 0278 – Looking north at right descending bank. Near EPA-C-0130 & SCC3-13.



Photo 0335 – Looking northeast at right descending bank. Near PO-C-0009.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 10.0 – MP 9.75 to 10.0

Enbridge Energy

September 21, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 10.0 had light levels of oil staining on the upstream portion of the left descending bank and moderate levels of oil staining on the downstream portion of the left descending bank. The shoreline of this bank was coated with oil, associated with pooling and surface residue. Woody overhanging vegetation and oil coated vegetation was also observed along the left descending bank. Multiple islands exist within the section. Coated vegetation was observed on the shoreline of the smaller island located at MP 10.0, while pooled tar was observed throughout the larger island located at MP 9.75. The right descending bank initially had moderate levels of staining along the entire ½ mile segment.

Actions

The shoreline clean-up activities within Segment 10.0 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Vegetation removal, leaving roots intact;
- Woody vegetation removal including some that were greater than 2" in diameter;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Removal of sheen using downstream deployment of absorbent boom;
- Pooled oil removal;

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Stained/saturated sediment remains on the right descending overbank and has been marked with yellow and black flags;
- Heavy oil staining remains on both banks of the creek located in the upstream portion of the right descending bank;
- Oiled soil, and oiled woody vegetation remain within zone A, as well as in general zones on the upstream island and the left descending bank;
- Oiled soil remains in the general zone in the upstream portion of right descending bank.

Two SCAT re-assessments were completed in order for segment 10.0 to reach the operational endpoint for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

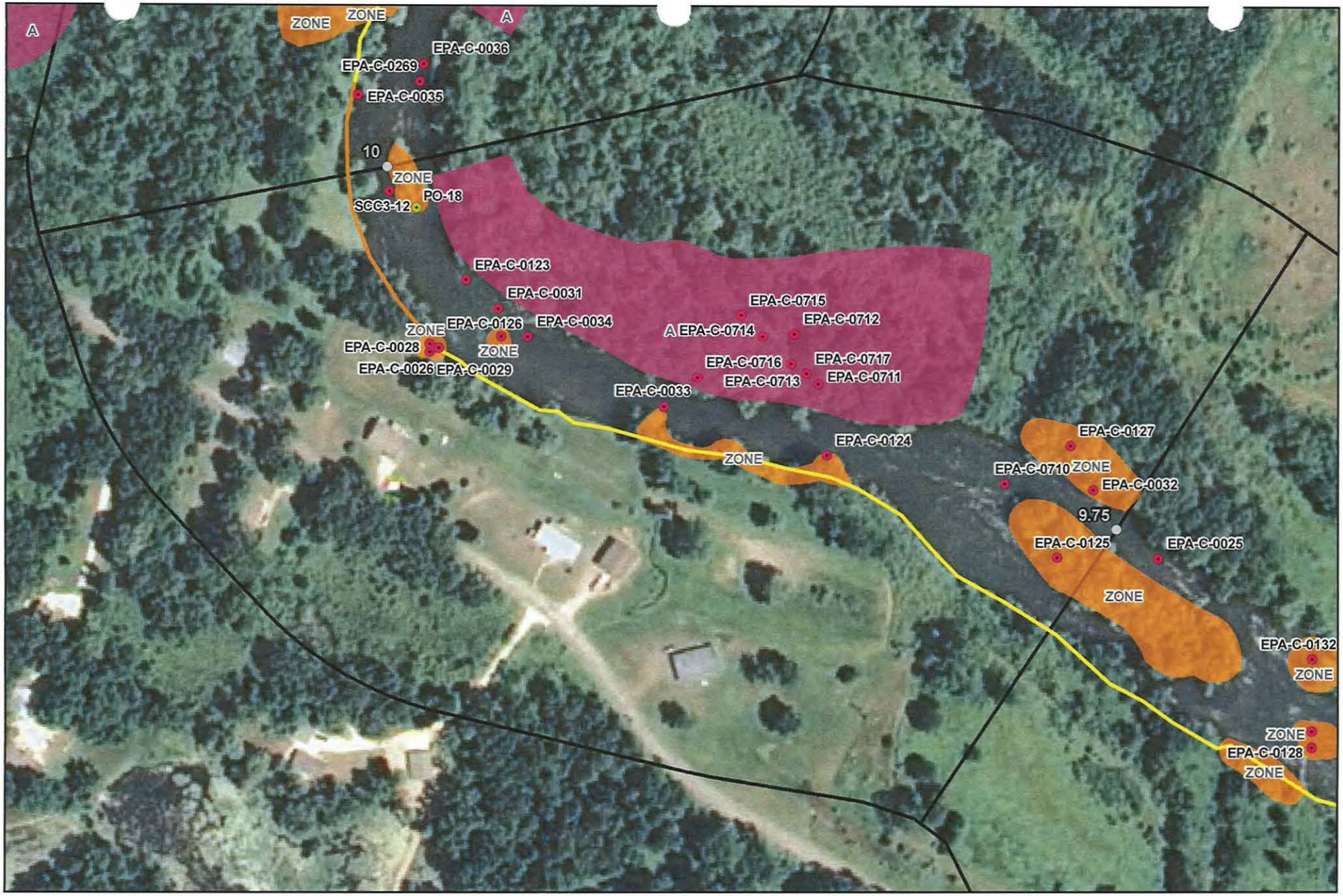
- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 9.75-10 Left Bank While Looking Downstream									
SCC3-12	Shoreline		●		●		Small island - high impact. Flush to existing skim operation.	42.29428	-85.12502
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B BC C D E F G H NO OIL ZONE

Division C: Mile Marker 9.75-10
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 9.75-10 Island									
EPA-C-0125	Island	SCAT-T2 8/17/2010		●			Island. Distressed frog. Pooled tar on island at least 2 spots. Nonoiled covered	42.29278	-85.12125
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B B/C C D E F G H NO OIL ZONE

Division C: Mile Marker 9.75-10 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

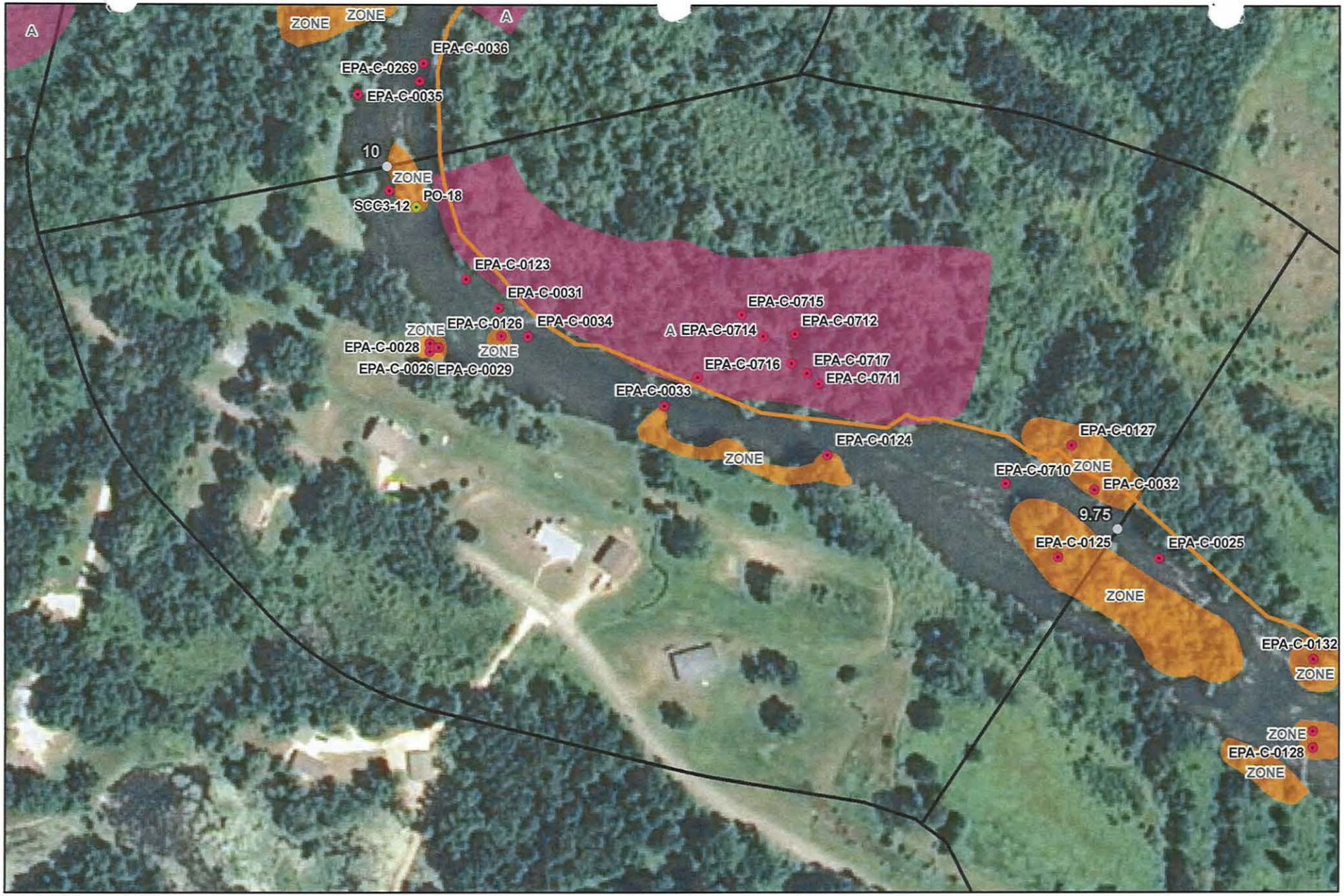
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Status	Date Completed
Division C: Mile Marker 9.75-10 Right Bank While Looking Downstream									
EPA-C-0127	Main/Side Channel	SCAT-T2 8/18/2010		●			Photo #2-5. Creek with sheen in power line easement. Multiple pooled oil (3mx4m and 1mx4m).	42.29325	-85.12118
* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods									





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 9.75-10
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 090810 Time: AM / PM 1500

Operations Division: C Segment ID: From 9.75 Start MP to End MP 10.00 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Jeff Reynolds

Division Supervisor(Contractor): Arnold Phillips

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

All items are completed.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 090810 Time: AM / PM 1530

Operations Division: C Segment ID: From 9.75 Start MP to End MP 10 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/ Cloudy

Field Inspection Team

Enbridge Inspector: Chad Vieu

Division Supervisor(Contractor): Arnold Gillis

SCAT Reviewed – Description of Clean Up Required

Reviewed all items as outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work completed.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9.75-10 Left Bank While Looking Downstream										
SCC3-12	Shoreline		•		•		Small island - high impact. Flush to existing skim operation.	42.29428	-85.12502	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods
Printed Team Member Names:
Date:
Comments:

EPA-C-0124 SCAT T2 (8/19) overhanging vegetation tar covered coated, shoreline coated with oil and surface oil residue. Recommendation to refer to Kalamazoo Enbridge Oil Cleanup Methods 42.2932 -85.12255 Y / N

EPA-C-0027 SCAT T1 (8/14) 42.29365 -85.124783 Y / N
EPA-C-0028 SCAT T1 (8/14) 42.293633 -85.12475 Y / N
EPA-C-0026 SCAT T1 (8/14) 42.293617 -85.124783 Y / N
EPA-C-0029 SCAT T1 (8/14) 42.293633 -85.12475 Y / N
EPA-C-0030 SCAT T1 (8/14) 42.293633 -85.124733 Y / N
EPA-C-0031 SCAT T1 (8/15) 42.2938 -85.1244 Y / N
EPA-C-0034 SCAT T1 (8/18) 42.293683 -85.124233 Y / N
EPA-C-0033 SCAT T1 (8/15) 42.2934 -85.123467 Y / N

No flags or lath were observed, when GPS coordinates were plugged into GPS unit the location points, along the boat launch at C-3.2. were West end of the

No Recommendations For Above Locations, Please refer to the Kalamazoo Enbridge Oil Cleanup Methods (Recommendations missing)

Team 3 - 9/11/10

Pamela Rice
Ken Mroczkowski
Eugene Dennis

Enbridge Pipeline Release Incident-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9.75-10 Left Bank While Looking Downstream										
SCC3-12	Shoreline		•		•		Small island - high impact. Flush to existing skim operation.	42.29428	-85.12502	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: MIKE ZAMBERLAN (ENBRIDGE) ... MATT WESENER (DNRE) HOWARD PHTAN, USEPA.

Date: 9/19/10

Comments:

EPA-C-0124 SCAT T2 (8/19) Woody overhanging vegetation cut 42.293 -85.123 (Y) / N

EPA-C-0033 SCAT T1 (8/15) This area had multiple way points collected, this reference combines their comments and recommendations: Cove covered with oil, with pooling associated and surface residue (fresh) 42.2934 -8412346 (Y) / N

EPA-C-0030 SCAT T1 (8/14) coated shoreline, with surface residue, vegetation coated 42.29363 -85.12473 (Y) / N

EPA-C0029 SCAT T1 (8/14) coated shoreline, with surface residue, vegetation coated 42.29363 -85.12473 (Y) / N

EPA-C-0028 SCAT T1 (8/14) coated shoreline, with surface residue, vegetation coated 42.29363 -85.12473 (Y) / N

EPA-C-0027 SCAT T1 (8/14) coated shoreline, with surface residue, vegetation coated 42.29363 -85.12473 (Y) / N

EPA-C-0026 SCAT T1 (8/14) coated shoreline, with surface residue, vegetation coated 42.29363 -85.12473 (Y) / N

EPA-C-0126 SCAT T2 (8/19) May be on opposite bank, pooled, fresh oil, forest island in comments, 42.29368 -85.12438 (Y) / N

Enbridge Pipeline Release l. ;ent-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9.75-10 Island										
EPA-C-0125	Island	SCAT-T2 8/17/2010		•			Island. Distressed frog. Pooled tar on island at least 2 spots. Nonoiled covered turtles = 11.	42.29278	-85.12125	(Y) / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: Pamela Rice, Enbridge/NRG; Eugene Dennis, USEPA OSC; Kenneth M. Mroczkowski, MDNRE

Date: 9/11/10

Comments: 9/19/10 Mike Zamboglis, ~~Howard Pham~~, USEPA MATT WESENER, DNRE

Enbridge Pipeline Release I[illegible]dent-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9.75-10 Right Bank While Looking Downstream										
This point appears EPA-C-0127 to have been labeled as EPA-C-0125 in the field	Main/Side Channel	SCAT-T2 8/18/2010		•			Photo #2-5. Creek with sheen in power line easement. Multiple pooled oil (3mx4m and 1mx4m).	42.29325	-85.12118	Y / N

9/14 changed EPA-C-0125 to EPA-C-0127 on flag

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: MIKE ZAMBETTS (ENBRIDGE), HOWARD PHAM, USEPA.

Date: (9/18/10) MATT WESENER (DNRE)

Comments:

9/14/10 Team 1
Dana Strouse (MDNRE)
Pamela Rice
ROSS DEL ROSARIO, USEPA

EPA-C-0123 SCAT T2 (8/19) Overhanging vegetation, covered, coated, tar coated vegetation. starts at residential.
Recommendation is to cut and remove overhanging vegetation. 42.293917 -85.124583 Y / N
EPA-C-0126 SCAT T2 (8/19) 42.293683 -85.124383 Y / N ASSUMED TO BE ONE OF POOLED OIL AREAS ON RIGHT BANK.
EPA-C-0032 SCAT T1 (8/15) 42.293067 -85.12105 Y / N

No Recommendations For Above Locations, Please refer to the Kalamazoo Enbridge Oil Cleanup Methods
(Recommendations missing)

9/14 workers working on LDB @ 1329 near MP 10.0 (Per Pamela crew is working on point that originates in 10.25)
Did not Re-SCAT LDB as we could not clear RDB

9/11/10 Observations from EPA-C-0127: The bank along the CREEK is heavily stained.
Appears they used caution flags and yellow/black flagging to note areas in overbank where there is stained / saturated sediment
Flags & stained sed [illegible] remain, especially under [illegible] logs and uprooted trees near stream [illegible].
Trees >2" were removed.

* WP 29 is error *

Team 3 - 9/11/10
Pamela Rice
Ken MROCZKOWSKI
Eugene Dennis

* 9/14 Pooled oil @ waypoint 128 N 42.29350, W 085.12260
35'x15'
5'x5' Pooled oil @ [illegible] 130 N 42.29370, W 085.12274
5'x10' 131 N 42.29358, W085.12275
✓ 30'x10' Pooled oil @ waypoint 132 N 42.29367, W085.12292
Pooled oil @ waypoint 133 N 42.29378, W085.12304
20'x20' Pooled oil @ waypoint 134 N 42.29[illegible]
3'x3' Pooled oil @ [illegible]
EPA-C-0711 ✓ 8'x3' pooled oil @ waypoint 135 N 42.29354, W085.12267

- Flagged pools ✓ and previously mark areas, included date & recommendations.

over →

9/14 '0

- Doug Dekker was called and text messaged between 1:30 p.m. and 2:00 p.m. Requesting a hot spot crew be sent to segment M.P. 10. Doug said that Larry was coming with a crew and could we wait to meet with him. Team 1 waited for Larry and his crew. Larry ended up being Lee Cook with a 4 person crew. Lee Cook said the clean up required a larger crew, dropped off the crew on the LDB at M.P. 10/M.P 10.25 and followed us by boat to the middle of segment 10.0. The Team spoke w/ Lee and showed him some of the areas that we flagged and briefed for clean up. Lee said that the area looked pretty bad and was going to require a team of 40 to 50 guys and it would take a week. In general he expressed concern over the scattered nature of the clean up efforts and lack of available clean-up personnel.

  Contact Info for Lee Cook - Land Ops - 850-393-2153

- Called Doug and debriefed him on the meeting with Lee Cook. Doug thanked me and we agreed that he would coordinate directly with Lisa Sullivan and/or Jeff Bencler.

Enbridge Pipeline Release I... ...ent-Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 9.75-10 Right Bank While Looking Downstream										
EPA-C-0127	Main/Side Channel	SCAT-T2 8/18/2010		●			Photo #2-5. Creek with sheen in power line easement. Multiple pooled oil (3mx4m and 1mx4m).	42.29325	-85.12118	Y / N

* For Operational Focus Areas not listed in this chart refer to the Kalamazoo River/Enbridge Spill- Clean up Recommendation Methods

Printed Team Member Names: MIKE ZAMBETIS (ENBRIDGE) MATT WESENER (DNRE), HOWARD PHAM, USEPA

Date: 9/19/10

Comments: NOTE: SEE SCAT REASSESSMENT O&M FORMS FOR TWO AREAS!

EPA-C-0032 SCAT T1 (8/15) Covered vegetation found 42.29306 -85.12105 Y / N

EPA-C-0127 SCAT T2 (8/19) Creek with sheen in power line easement, multiple pooled oil of differing sizes 42.293 -85.121 Y / N

EPA-C-0034 SCAT T1 (8/18) fresh oil, pooled oil in a march inlet, tar coated, over bank coated, along with marshland coated in oil 42.29368 -85.12423 Y / N

EPA-C-0031 SCAT T1 (8/15) Pooled oil, cove with covered vegetation with surface residue 42.2938 -85.1244 Y / N

EPA-C-0123 SCAT T2 (8/19) Woody overhanging vegetation 42.294 -85.125 Y / N

EPA-C-0711 (42.2935 -85.1226), 0712 (42.2937 -85.12274), 0713 (42.29358 -85.12275), 0714 (42.29369 -85.12292), 0715 (42.29378 -85.12304), 0716 (42.29352 -85.12328), 0717 (42.29354 -85.12267) All are pooled pool locations, remove pooled oil Y / N

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 9.75 **to MP** 10.00 **Segment Length: 0.25 mile**

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley (date) 10-Sept-2010 Enbridge

Signature Eugene Dennis (date) 9/10/10 EPA

4. **SCAT Reassessment**

Signature MICHAEL A. [illegible] (date) 9/19/10 Enbridge

Signature HOWARD PRATT (date) 9/19/10 EPA

Signature MATTHEW D WESENER (date) 9/19/10 MDNRE

5. **EPA**

Signature Jordan Barrard (date) 9/23/10 EPA Division Supervisor

Appendix E
Photographs

Field Photo Log – Segment 10.0



Photo 0536 – Facing east at island near EPA- C-0710.



Photo 0537 – Facing east at island near EPA-C-0125

Field Photo Log – Segment 10.0



Photo 0540 – Facing west at left descending bank near EPA-C-0124.



Photo 0541 – Facing west at left descending bank near EPA-C-0033.

Field Photo Log – Segment 10.0



Photo 0542 – Facing southwest at left descending bank.

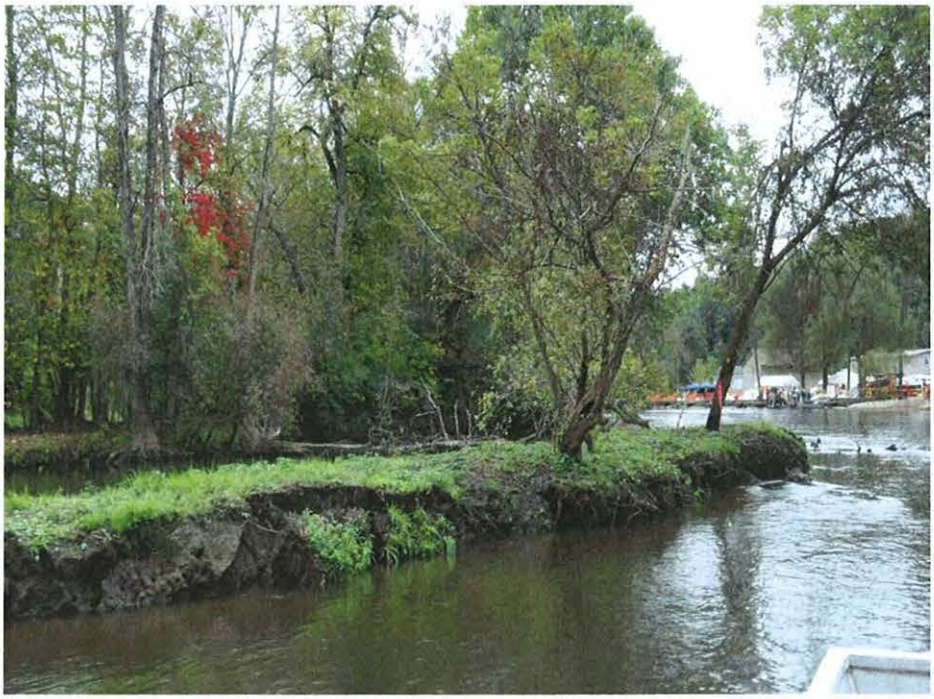


Photo 0546 – Facing northeast at island near SCC3-12.

Field Photo Log – Segment 10.0



Photo 0549 – Facing east at right descending bank.



Photo 0552 – Facing northeast at right descending overbank.

Field Photo Log – Segment 10.0



Photo 0553 – Facing southwest at right descending overbank.



Photo 0554 – Facing southeast at right descending bank near EPA-C-0716.

Field Photo Log – Segment 10.0



Photo 0555 – Facing west at right descending bank near EPA-C-0716.



Photo 0557 – Facing northwest at right descending overbank near EPA-C-0715.

Field Photo Log – Segment 10.0



Photo 0650 – Facing west at right descending overbank near EPA-C-0714.



Photo 0561 – Facing west at right descending bank near EPA-C-0711.

Field Photo Log – Segment 10.0



Photo 0562 – Facing northeast at right descending bank near EPA-C-0127.



Photo 0563 – Facing west at right descending overbank near EPA-C-0315.

Field Photo Log – Segment 10.0



Photo 0564 – Facing west at right descending bank near EPA-C-0032.



Photo 0565 – Facing northwest at left descending bank near EPA-C-0028.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 10.25 – MP 10.0 to 10.25

Enbridge Energy

September 23, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 10.25 had moderate levels of oil staining on the left descending bank in the upstream portion of the segment and light oil staining in the mid and downstream portion of the left descending bank. Small amounts of pooled oil and oiled debris were observed along the bank, while sporadic areas of oiled vegetation were identified throughout the overbank. SCAT teams observed some pooled oil and heavily coated vegetation on residential shoreline within the upstream portion of the left descending bank. A 10% tar cover/coat was specifically noted within an emergent wetland on the left descending bank/overbank toward the downstream mile marker. One small island was present in the upstream portion of the segment, bordering the right descending bank. Pooled oil was observed in the island's interior. The right descending bank had moderate levels of oil staining. Woody debris and oiled vegetation were observed along this bank as well. The overbank, in the upstream portion of the segment, had patches of tar which were found to be between 20 and 60 feet wide. Patches included oily, woody and vegetated debris as wells as areas of pooled oil. Further downstream, mid-segment to the 10.25 mile marker, stained vegetation, oiled debris and tarry pools were observed throughout overbank area. While walking in the river just off the right shoreline, in the upstream and middle portion of the segment, SCAT teams observed tar globes rising to the surface of the water along with oil banding on the lower portion of shrubs.

During the initial assessment, water levels were high due to flood conditions, creating the island mentioned above. At the time of re-assessment, SCAT teams designated this area as being part of the right descending bank due to significantly lowered water levels.

Actions

The shoreline clean-up activities within Segment 10.25 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Vegetation removal, leaving roots intact and woody plants greater than 2" in diameter;
- Manual removal of oiled debris;
- Pooled oil removal.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil remains along the right descending bank throughout the segment.
- Oiled debris remains from the upstream portion of the segment down to the midway portion of the segment along the left descending bank.
- Oiled woody vegetation, oiled debris and sheen remains in the mid-section of the segment on the right descending bank/overbank.
- Oiled woody vegetation remains on the left descending overbank midway between mile marker 10.0 and 10.5.

Segment 10.25 has reached the operational endpoint for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 10-10.25 Left Bank While Looking Downstream										
SCC3-11	Shoreline	Shoreline Assessment	●	●	●	●	Small amount of pooled oil. Log jam with debris.		42.29640	-85.12550
EPA-C-0035	Shoreline/ Overbank	SCAT T1 8/17/10	residential shoreline with some pooled oil and heavily coated vegetation					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29468	-85.12520





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 10-10.25
Left Bank While Looking Downstream

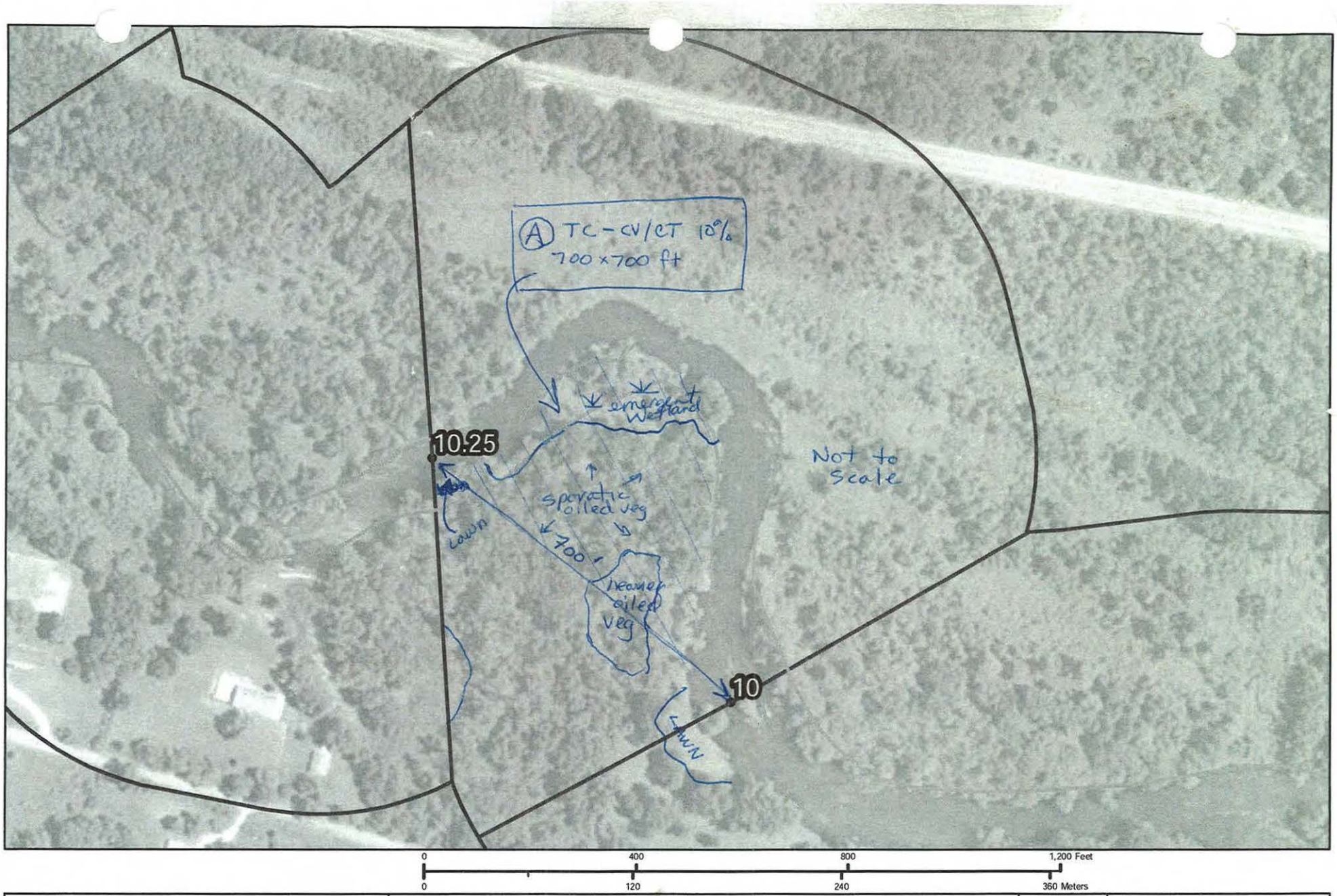
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Team #1 8/26/10

- QuartermileMarkers
- Shoreline
- River_QuarterMiles
- Divisions

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

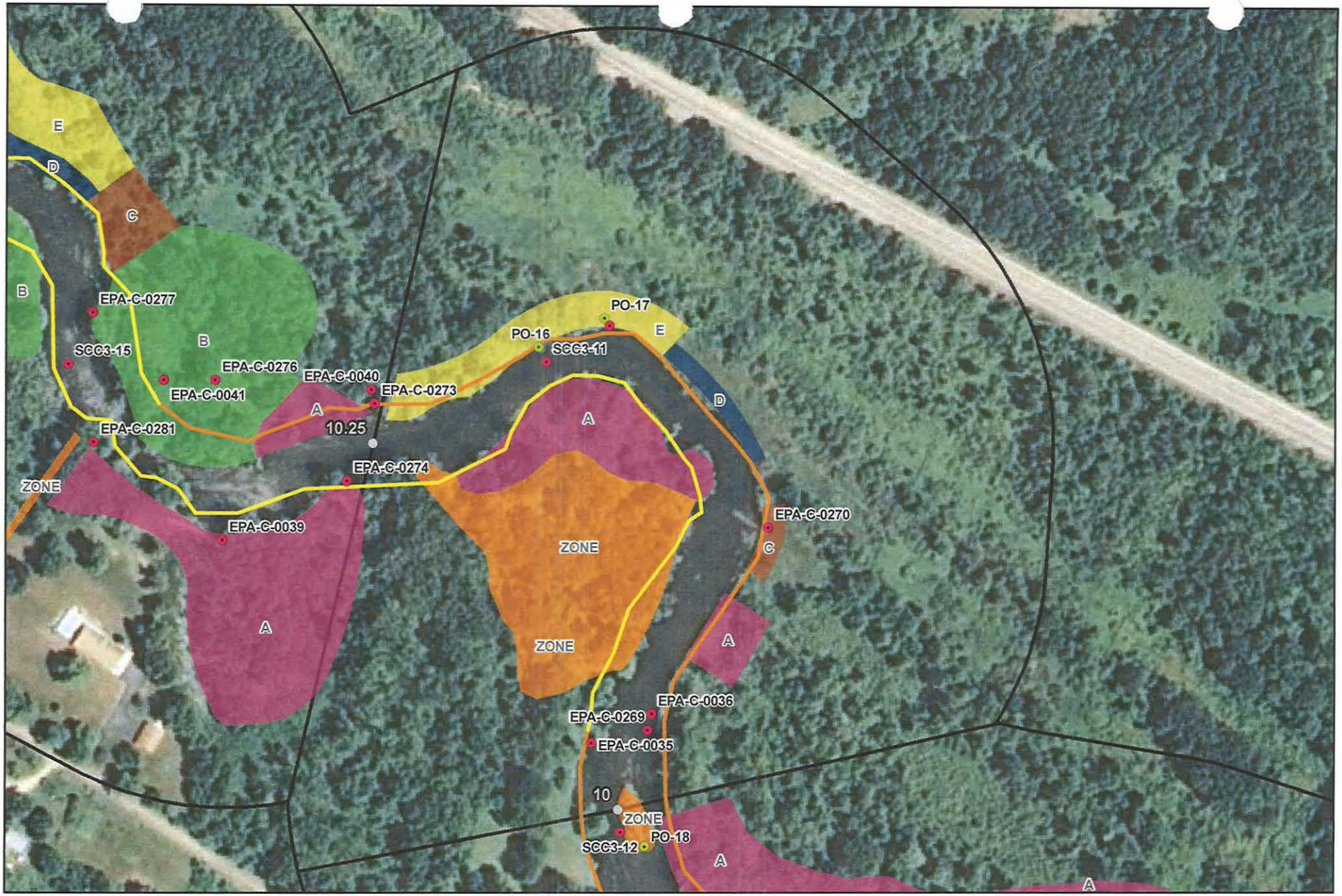
SHEET #: 48

ENTRIX
Down to Earth. Down to Business.™
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 10-10.25 Island										
EPA-C-0036	Shoreline/Overbank	SCAT T1 8/17/10	pooled oil in the island interior					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29482	-85.12483





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 10-10.25 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

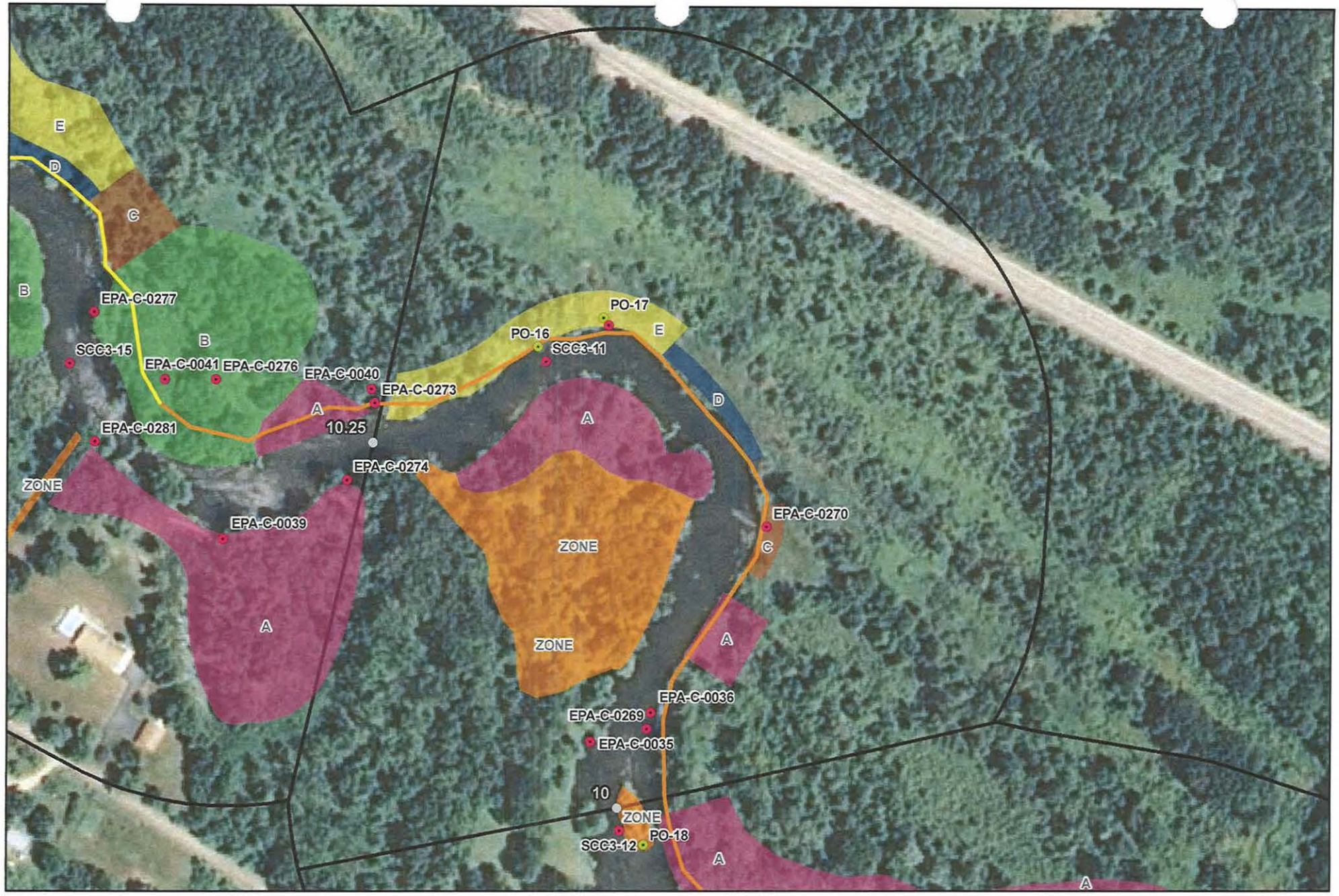
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 10-10.25 Right Bank While Looking Downstream										
EPA-C-0269	Shoreline	SCAT T2 8/28/10	Starting Point at 10.0 Right Descending Bank Shoreline was not oiled except for a patch right at marker 10.0. Overbank has patches of tar which is found between 20-60ft on the over bank. Patches include oily, woody, and vegetated debris and pooled tarry. While walking in river, film and tar globes rise to the surface of the water.					Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	42.29474	-85.12486
EPA-C-0270	Shoreline	SCAT T2 8/28/10	Zone C consists of dead fallen tree in river. Photo 209. While walking in river, film and tar globes rise to the surface of the water.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.29566	-85.12413
EPA-C-0037	Shoreline/ Overbank	SCAT T1 8/18/10	Oil under shrubs, major banding along riverbanK					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29657	-85.12512





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 10-10.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

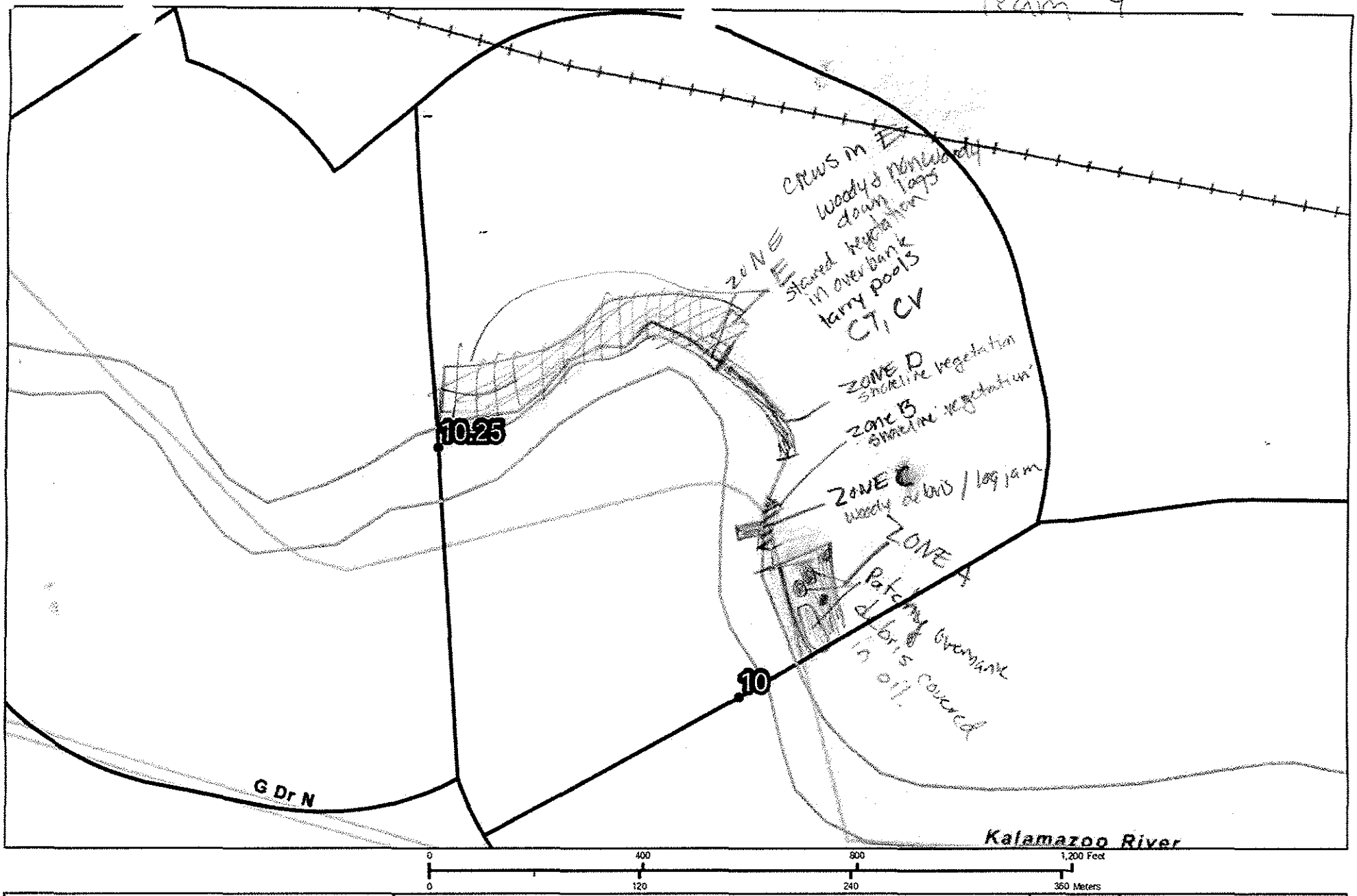
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuarterMileMarkers
Shoreline
River_QuarterMiles
Divisions

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

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Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 09-16-10 Time: AM / PM

Operations Division: C Segment ID: From 10.0 Start MP to End MP 10.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ Cloud cover + Rain off + on

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recommendations

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

*Submerged oil by Tree in the water.

No Recommendations

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-15-10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 10.0 **Start MP to End MP** 10.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Rain

Field Inspection Team

~~**EPA Inspector:**~~

Enbridge Inspector: David Pessyas

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

Reviewed 6 areas of concerns from the SCAT report.
Clean up needed coated vegetation, pooled oil, flushing, debris removal.

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Inspected 6 areas from the SCAT report. All complete according to the recommendation methods

Punchlist Items Identified

☑ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release ent - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 10-10.25 Left Bank While Looking Downstream											
SCC3-11 ✓	Shoreline	Shoreline Assessment	●	●	●	●	Small amount of pooled oil. Log jam with debris.		42.29640	-85.12550	(Y) / N
EPA-C-0035	Shoreline/ Overbank	SCAT T1 8/17/10	residential shoreline with some pooled oil and heavily coated vegetation					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29468	-85.12520	(Y) / N

Printed Team Member Names: Mike Van Loan, Chris Lynn, Ross DelRosario
Date: 9/21/10
Comments:

Enbridge Pipeline Release *Ident - Kalamazoo River Oil Spill*

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 10-10.25 Island											
(ON RDB NOT ISLAND) EPA-C-0036	Shoreline/Overbank	SCAT T1 8/17/10	pooled oil in the island interior RDB					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29482	-85.12483	(Y) / N

Printed Team Member Names: mike Van Loan, Chris Conn, Ross DelRosario

Date: 9/21/10

Comments: On RDB

Enbridge Pipeline Release . Jent - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 10-10.25 Right Bank While Looking Downstream											
EPA-C-0269	Shoreline	SCAT T2 8/28/10	Starting Point at 10.0 Right Descending Bank Shoreline was not oiled except for a patch right at marker 10.0. Overbank has patches of tar which is found between 20-60ft on the over bank. Patches include oily, woody, and vegetated debris and pooled tarry. While walking in river, film and tar globes rise to the surface of the water.					Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	42.29474	-85.12486	Y / N
EPA-C-0270	Shoreline	SCAT T2 8/28/10	Zone C consists of dead fallen tree in river. Photo 209. While walking in river, film and tar globes rise to the surface of the water.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.29566	-85.12413	Y / N
EPA-C-0037	Shoreline/ Overbank	SCAT T1 8/18/10	Oil under shrubs, major banding along riverbanK					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29657	-85.12512	Y / N

Printed Team Member Names: Mike Van Luan, Chris Conn, Ross DiRosario
Date: 9/21/10
Comments: A few very small patches of oily veg remains, but minor. No further clean-up needed.

Oil delineation area per floodplain data (see attached map). Area was not collected during initial SCAT 42.29600 -85.12600
P0-16 (8/16) Refer to Kalamazoon Enbridge spill clean up methods. 42.296 -85.126 Y / N
P0-17 (8/16) Refer to Kalamazoon Enbridge spill clean up methods. 42.297 -85.125 Y / N

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From** 10^00 **Start MP to End MP** 10^25 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature MATT BURDSON (date) 9-18-10 Enbridge

Signature Eugene Dennis, EPA OSC (date) 9-18-2010 EPA

4. **SCAT Reassessment**

Signature Michael Van Loan (date) 9/21/10 Enbridge

Signature Ross Del Rosario (date) 9/21/10 EPA

Signature Chris Conn (date) 9/21/10 MDNRE

5. **EPA**

Signature Jordan Gerrard (date) 9/24/10 EPA Division Supervisor

Appendix E
Photographs

Field Photo Log – Segment 10.25



Photo 0645 – Facing northeast at right descending bank near EPA-C-0270.



Photo 0647 – Facing northwest at right descending bank near EPA-C-0037.

Field Photo Log – Segment 10.25

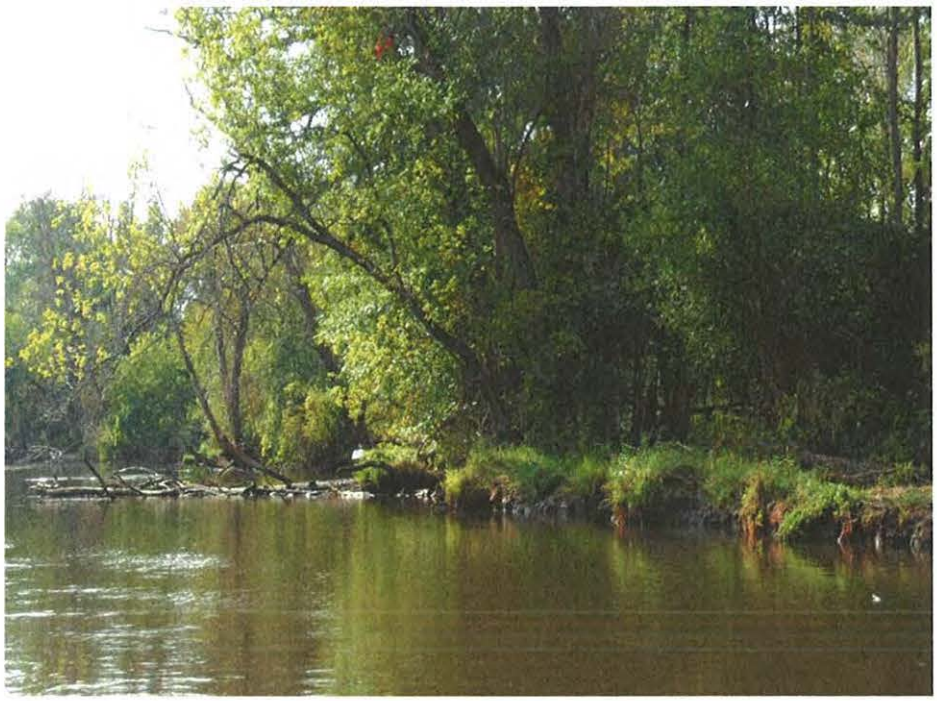


Photo 0648 – Facing southwest at left descending bank.



Photo 0650 – Facing east at left descending bank near SCC3-11.

Field Photo Log – Segment 10.25



Photo 0651 – Facing east at left descending bank.



Photo 0652 – Facing southeast at left descending overbank in zone A.

Field Photo Log – Segment 10.25

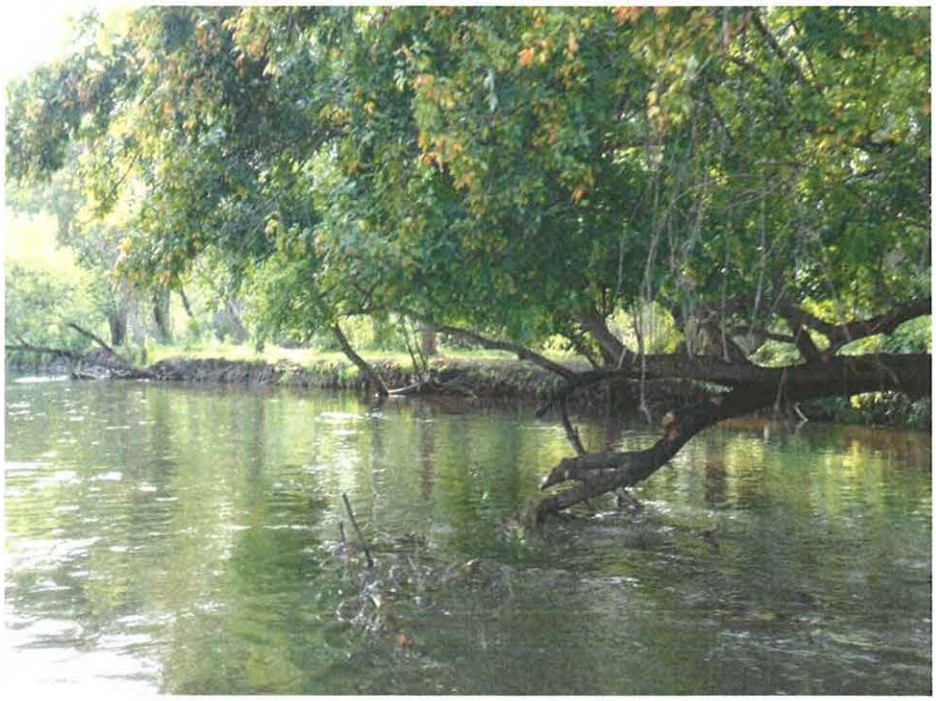


Photo 0656 – Facing south at left descending bank.



Photo 0657 – Facing south at left descending bank near EPA-C-0035.

Field Photo Log – Segment 10.25



Photo 0658 – Facing east at right descending overbank near EPA-C-0036.



Photo 0659 – Facing south at right descending overbank near EPA-C-0269.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 10.5 – MP 10.25 to 10.5

Enbridge Energy

September 21, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 10.5 had light levels of oil staining along the left descending bank. The majority of oil observed in the upstream portion of the bank is interior from the shoreline. Oiled vegetation was observed on vegetation, as well as oiled overhanging vegetation. Downstream of this area, oil was observed in an emergent wetland area that comes off the river in a low lying channel. In addition, heavily oiled vegetation was observed in the main channel off the left descending bank towards the downstream portion of the segment. Stained/oily vegetation was observed on the right descending overbank. SCAT teams also observed tar globs in the water just off the right descending bank in this region of the segment. As teams moved downstream along this bank, they noticed large pools of oil, oiled vegetation, a pond/inlet area with oil coated aquatic vegetation and a film on the water, heavy tar coated debris on the forest floor and saturated soils.

Actions

The shoreline clean-up activities within Segment 10.5 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Passive sorbent use to minimize disturbance of substrate and vegetation in wetland areas and to prevent excess waste generation;
- Removal of sheen using downstream deployment of absorbent boom;
- Pooled oil removal.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Significant saturated soils remain and are to be turned over to the submerged oil task force;
- Oiled woody vegetation along the left descending bank in SCAT zone A;
- Oiled rock/cobble along the left descending bank in SCAT zone A;
- Oiled sediment along the left descending bank in SCAT zone A and B, and downstream portion;
- Oiled herbaceous vegetation along the left descending bank in SCAT zone B and in downstream portion;

- Oiled debris along the right descending bank in SCAT zone A;
- Oiled herbaceous vegetation along the right descending bank in SCAT zone A and F;
- Oiled woody vegetation along the right descending bank in SCAT zone B, E, and F;
- Oiled sediment along the right descending bank in SCAT zone E.

Segment 10.5 has reached the operational endpoint for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

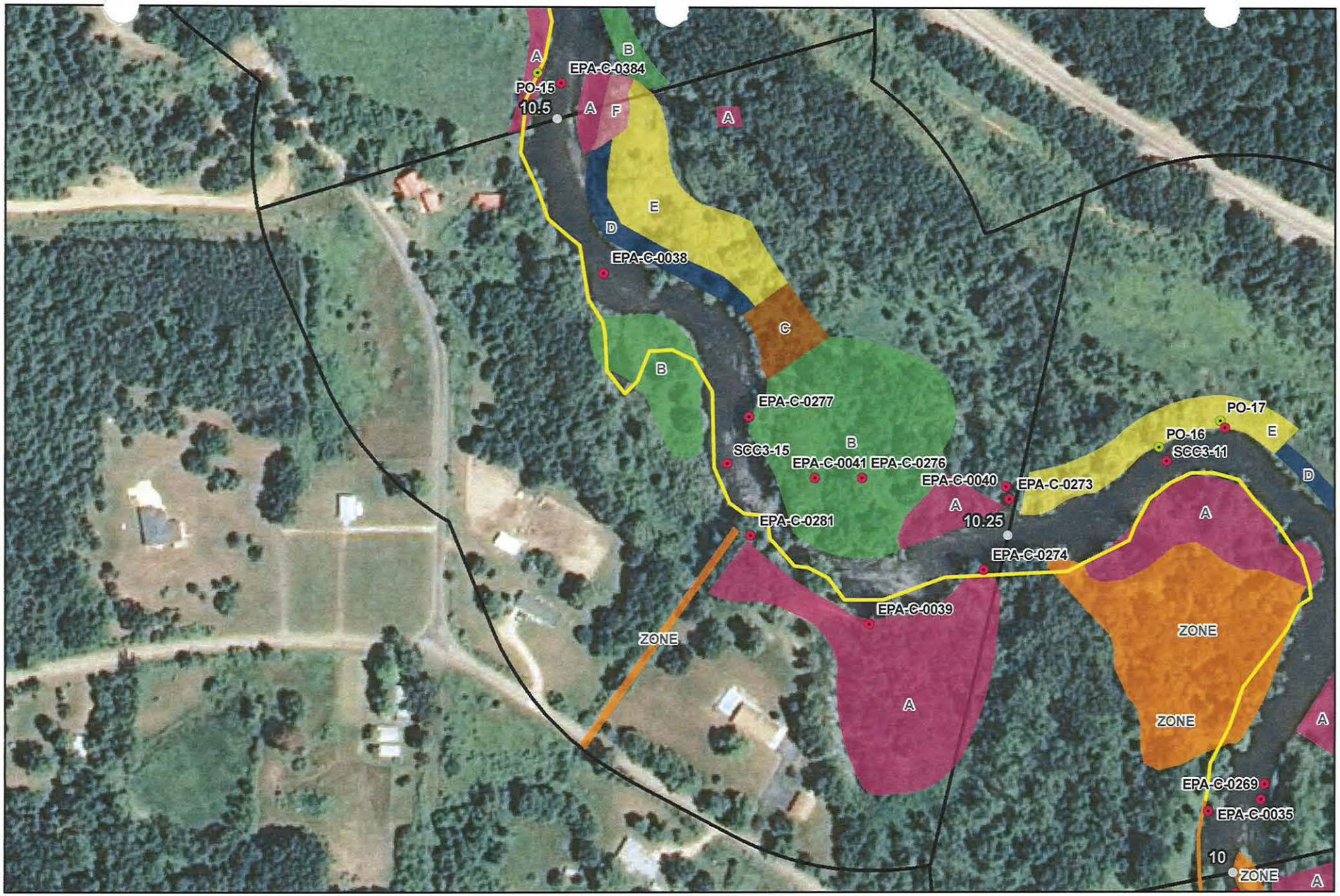
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 10.25-10.5 Left Bank While Looking Downstream										
EPA-C-0274	Shoreline	SCAT T1 8/28/10	GPS at mile post 10.25. Majority of oil is interior from shoreline, >50 ft back. Oiled vegetation observed; oil was on shoots and leaves, not roots or ground/soil. Several frogs observed along bank near 10.25 mile post. Oiled, overhanging vegetation observed along bank.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.29586	-85.12671
EPA-C-0281	Shoreline	SCAT T1 8/28/10	Oil is in emergent wetland that comes off the river--low-lying channel. Forrested, some residential. Where floodplain ends, oil tar patches end. River bank oiled relatively lightly, except overhanging veg as noted.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29602	-85.12826
EPA-C-0038	Main Channel	SCAT T1 8/14/10	WP66 - heavily oiled vegetation in wetland					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29730	-85.12925
EPA-C-0039		SCAT T1 8/17/10						* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29558	-85.12747





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 10.25-10.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

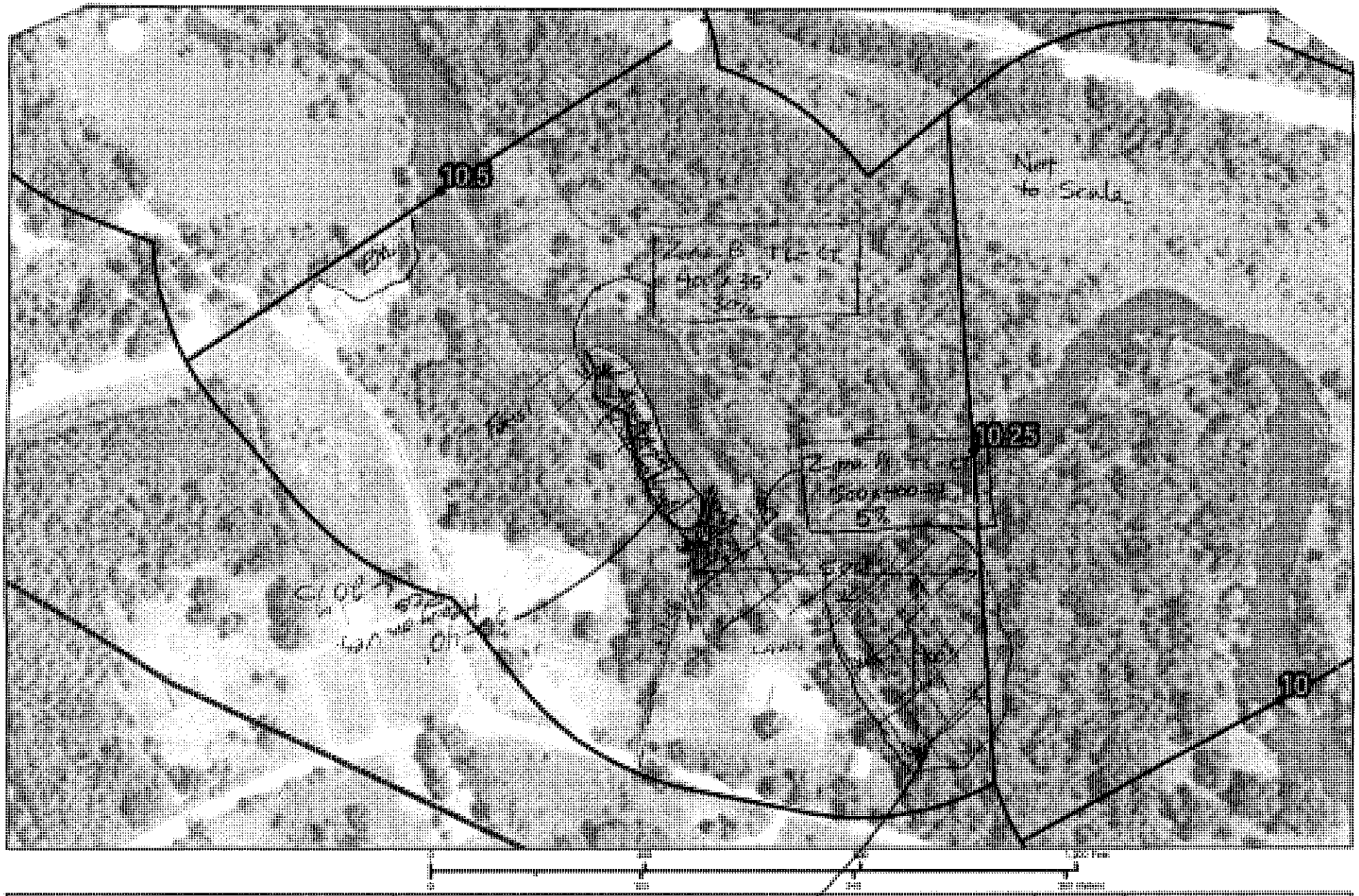
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



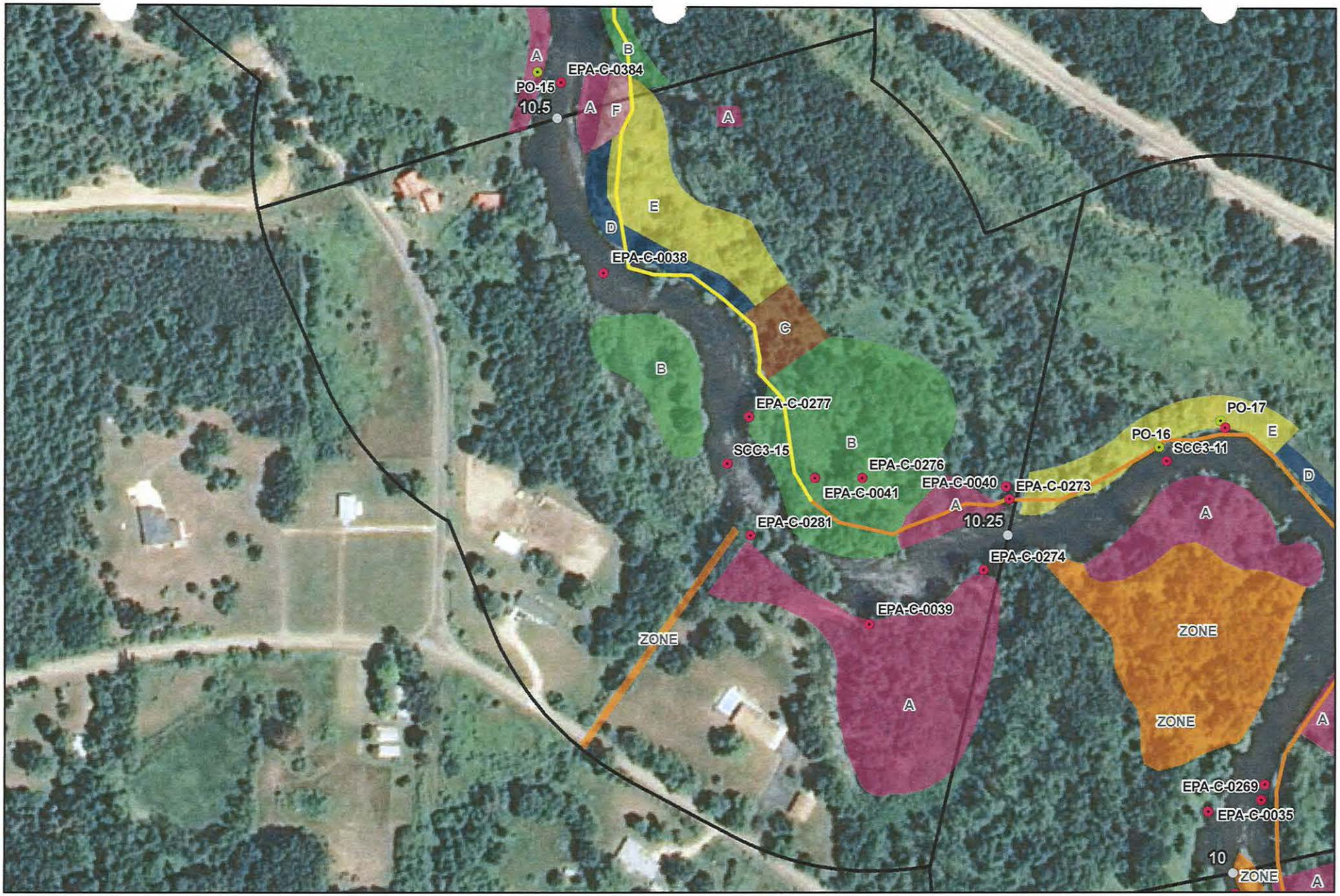
SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 10.25-10.5 Right Bank While Looking Downstream										
EPA-C-0273	Shoreline	SCAT T1 8/28/10	Crews were working. Overbank veg is stained/oily at the base. Photo 210 and 211While walking in river, film and tar globes rise to the surface of the water.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.29621	-85.12654
EPA-C-0276	Shoreline	SCAT T4 8/28/10	This area had large pools of oil Lots of oil on vegetation Some workers may have started to start cutting vegetation but left the pieces behind Lot's of attention should be given to this area..... Photos 214-215-216					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.29630	-85.12752
EPA-C-0277	Shoreline	SCAT T4 8/28/10	Zone C consists of a pond/inlet area that has some oil coated aquatic vegetation Film of oil on pond Photo 217 and 218					Minimize entry (to prevent unnecessary substrate contamination).	42.29660	-85.12827
EPA-C-0040	Shoreline/ Overbank	SCAT T1 8/18/10	Heavy tar coating debris on forest floor					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29627	-85.12657
EPA-C-0041	Shoreline/ Overbank	SCAT T1 8/18/10	Pooled oil and surface oil along with tar					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29630	-85.12783
SCC3-15	Shoreline	Shoreline Assessment	●	●	●		Oiling on private property approx 10m in. Oiling is moderate to heavy. Some pooled oil.		42.29637	-85.12842





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 10.25-10.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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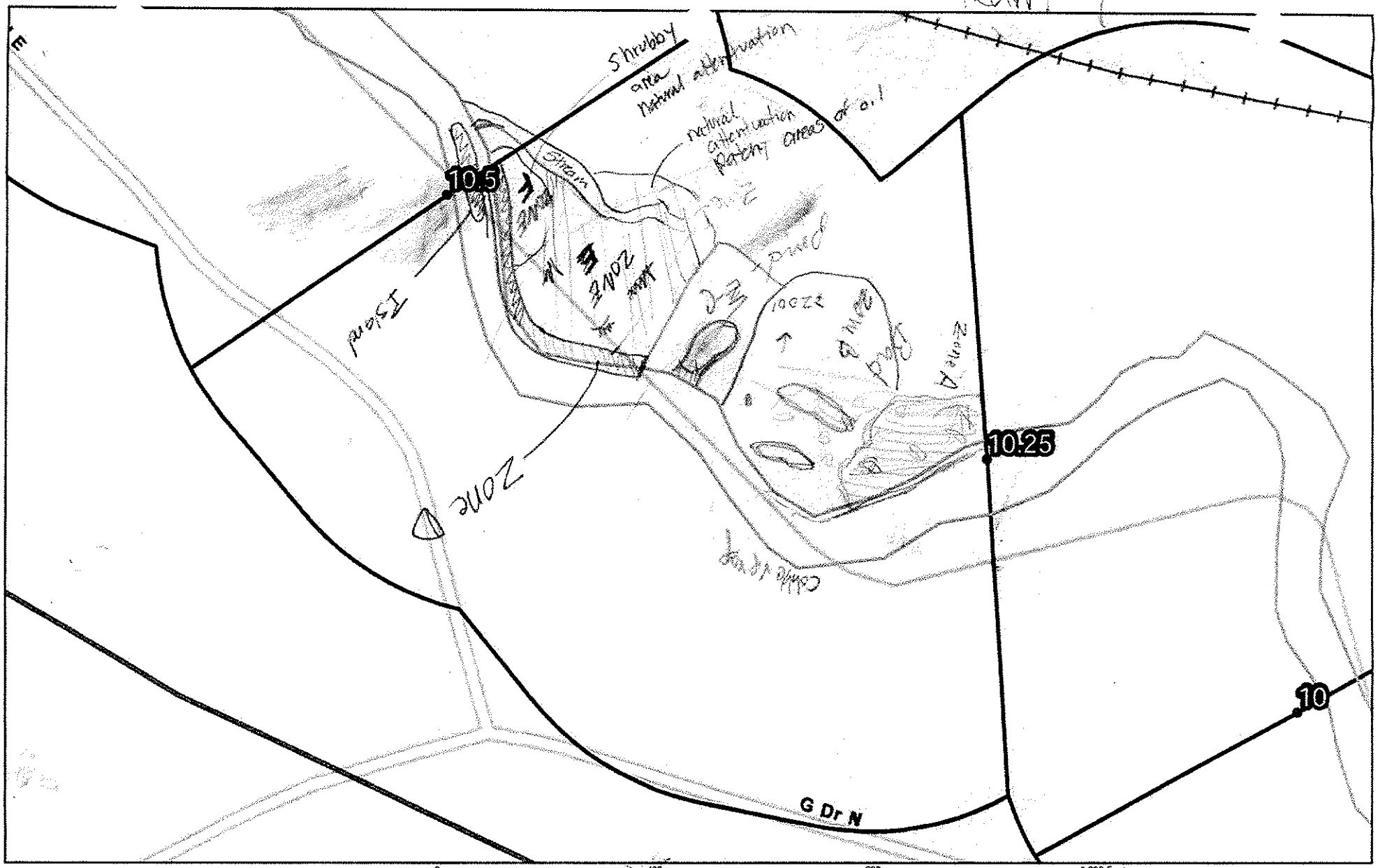
Coordinate System: NAD 1983 State Plane Michigan South Feet



QuarterMileMarkers
Shoreline
River_QuarterMiles
Division

SHORELINE CLEANUP PLAN - SEGMENT SC01
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 48

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Coordinate System: NAD 1983 STATE PLANE MICHIGA YH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 09-13-10 **Time: AM (PM)**

Operations Division: C **Segment ID: From** 10.25 **Start MP to End MP** 10.50 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/ Stopped Several Times Throughout Day Because of Electrical Storms.

Field Inspection Team

Enbridge Inspector: John Bunge

Division Supervisor(Contractor):

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recommendations

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recommendations

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recommendations

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recommendations

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-18-10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 10.25 **Start MP to End MP** 10.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Rain

Field Inspection Team

~~**EPA Inspector:**~~

Enbridge Inspector: David Peters

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 10 areas of concern from the SCAT report.
Clean up needed; Coated vegetation, pooled oily debris removal, and Flushing

Clean Up Performed -- Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 10 areas of concern from the SCAT report
Clean up all complete according to the recommendation methods

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

N/A

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release ident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 10.25-10.5 Left Bank While Looking Downstream											
EPA-C-0274	Shoreline	SCAT T1 8/28/10	GPS at mile post 10.25. Majority of oil is interior from shoreline, >50 ft back. Oiled vegetation observed; oil was on shoots and leaves, not roots or ground/soil. Several frogs observed along bank near 10.25 mile post. Oiled, overhanging vegetation observed along bank.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.29586	-85.12671	(Y) / N
EPA-C-0281	Shoreline	SCAT T1 8/28/10	Oil is in emergent wetland that comes off the river--low-lying channel. Forrested, some residential. Where floodplain ends, oil tar patches end. River bank oiled relatively lightly, except overhanging veg as noted.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29602	-85.12826	(Y) / N
EPA-C-0038	Main Channel	SCAT T1 8/14/10	WP66 - heavily oiled vegetation in wetland					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29730	-85.12925	(Y) / N
EPA-C-0039		SCAT T1 8/17/10						* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29558	-85.12747	(Y) / N

Printed Team Member Names: GLENN VANNOY WATER 9/19/10 Eduardo Rovira 9/19/10 Ernie Sarkipato 9/19/10

Date:

Comments:

SEE O&M SHEET:

SATURATED SOILS; SOME POOLED AT SE SIDE OF LAGOON AREA APPROX 2/3 WAY TO 10.5 MARKER

SCAT

BASED ON ORIGINAL RECOMMENDATIONS, ACTIONS TO REMOVE OILED VEGETATION AND SURFICIAL OIL HAVE BEEN UNDERTAKEN; HOWEVER SATURATED SOILS REMAIN; AND ACCORDING TO DAVE PESSES (NRG) and DOUG BENNET (ENBRIDGE) AREAS WITH SIGNIFICANT SATURATED SOILS ARE BEING TURNED OVER TO THE SUBMERGED OIL TASK FORCE

Enbridge Pipeline Release ı. ..ent - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 10.25-10.5 Right Bank While Looking Downstream											
EPA-C-0273	Shoreline	SCAT T1 8/28/10	Crews were working. Overbank veg is stained/oily at the base. Photo 210 and 211While walking in river, film and tar globes rise to the surface of the water.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.29621	-85.12654	Y / N
EPA-C-0276	Shoreline	SCAT T4 8/28/10	This area had large pools of oil Lots of oil on vegetation Some workers may have started to start cutting vegetation but left the pieces behind Lot's of attention should be given to this area..... Photos 214-215-216					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.29630	-85.12752	Y / N
EPA-C-0277	Shoreline	SCAT T4 8/28/10	Zone C consists of a pond/inlet area that has some oil coated aquatic vegetation Film of oil on pond Photo 217 and 218					Minimize entry (to prevent unnecessary substrate contamination).	42.29660	-85.12827	Y / N
EPA-C-0040	Shoreline/ Overbank	SCAT T1 8/18/10	Heavy tar coating debris on forest floor					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29627	-85.12657	Y / N
EPA-C-0041	Shoreline/ Overbank	SCAT T1 8/18/10	Pooled oil and surface oil along with tar					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29630	-85.12783	Y / N
SCC3-15	Shoreline	Shoreline Assessment	●	●	●		Oiling on private property approx 10m in. Oiling is moderate to heavy. Some pooled oil.		42.29637	-85.12842	Y / N

Printed Team Member Names: GENN UW, EDWARDO R. ERNIES.
Date: 9/14/10
Comments:

SEE O&M SHEET:
LARGE AREA OF SPOTTED LOCATIONS WITH SUB-SURFACE OIL

BASED ON ORIGINAL SCAT RECOMMENDATIONS, ACTIONS TO REMOVE OILED VEG. AND SURFICIAL OIL HAVE BEEN UNDER TAKEN
HOWEVER, SATURATED SOILS REMAIN, AND ACCORDING TO SECTION INSPECTOR, THESE AREAS WILL BE REFERRED TO THE SUBMERGED OIL TASK FORCE.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From** 10.25 **Start MP to End MP** 10.50 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☐

3. **Inspection**

Signature (date) Enbridge

Signature (date) EPA

See separate form, SCAT Reassessment Signed off after Step 2 process.

4. **SCAT Reassessment**

Glenn Vande Walle 9/19/10
Signature GLENN VANDE WALLE (date) Enbridge

Eduardo Rovira 9/19/10
Signature Eduardo Rovira (date) EPA

9/20/10
Signature Ernest Sarkipato (date) MDNRE

5. **EPA**

9/23/10
Signature Jordan Garrard (date) EPA Division Supervisor

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From** 10^25 **Start MP to End MP** 10^30 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature (date) 9-19-10 Enbridge

Signature (date) 9-19-2010 EPA
Eugene Dennis EPA, OSC

4. **SCAT Reassessment**

Signature (date) Enbridge

Signature (date) EPA

Signature (date) MDNRE

5. **EPA**

Signature (date) EPA Division Supervisor

Appendix E
Photographs

Field Photo Log – Segment 10.5



Photo 0566 – Facing north at right descending bank near EPA-C-0273.



Photo 0569 – Facing northeast at right descending overbank near EPA-C-0276.

Field Photo Log – Segment 10.5



Photo 0571 – Facing north at right descending bank near EPA-C-0276.



Photo 0572 – Facing northeast at right descending overbank near EPA-C-0041/SCC0-14.

Field Photo Log – Segment 10.5



Photo 0573 – Facing north at right descending near EPA-C-0277.



Photo 0574 – Facing north at right descending overbank near EPA-C-0277.

Field Photo Log – Segment 10.5



Photo 0575 – Facing northeast at right descending overbank near EPA-C-0277.



Photo 0576 – Facing northwest at right descending bank near zone B.

Field Photo Log – Segment 10.5



Photo 0586 – Facing northwest at right descending bank near zone D.



Photo 0588 – Facing north at island near EPA-C-0384.

Field Photo Log – Segment 10.5



Photo 0590 – Facing south at left descending bank near EPA-C-0038.



Photo 0599 – Facing east at left descending overbank near EPA-C-0281.

Field Photo Log – Segment 10.5



Photo 0601 – Facing southeast at left descending bank near EPA-C-0039.



Photo 0607 – Facing north at left descending overbank near zone A.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 10.75 – MP 10.5 to 10.75

Enbridge Energy

September 22, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 10.75 had light levels of oil staining on the left descending bank. Heavily impacted tree roots, pooled oil, oiled sediment and coated vegetation were observed along this bank as well. In general, a thin tar coat was observed throughout all zones identified on the left descending bank/overbank; ranging from 5% cover on the downstream overbank to 90% cover on the upstream shoreline. Although the shoreline of left descending bank had relatively light oiling, SCAT teams noted a film of surface oil collecting in the channel behind the island off this bank, as well as oiled limbs hanging over and into the water. On this island, a 50% tar cover was observed. A second island, further upstream off the right descending bank, contained sparsely oiled vegetation along its shoreline with sheen noted on the east end. The third island surveyed is located in the upstream portion of this segment. Major surface oil, pockets of pooled oil and tarred/saturated soil were observed here. The right descending bank had light oil staining with moderate to heavy oil observed on the grass line within the upstream overbank area of the segment; specifically in the floodplain.

Actions

The shoreline clean-up activities within Segment 10.75 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Removal of oil using pom-poms;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Vegetation removal, leaving roots intact and woody plants greater than 2" in diameter;
- Removal of sheen using downstream deployment of absorbent boom;
- Pooled oil removal.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled herbaceous vegetation remains on the shoreline of the left descending bank in the upstream portion of the segment;

- Tarred/saturated soils remain on the shoreline of the left descending bank in upstream portion of the segment as well as on the downstream island off the right descending bank, and are to be turned over to the submerged oil task force;
- Oiled woody vegetation remains in the shoreline of the upstream island off the left descending bank as well as on the downstream island off the right descending bank;
- Oiled debris remains along the shoreline of the right descending bank;
- Two channels, one off the right descending bank upstream, and one on the left descending bank mid-segment, will likely require operations and maintenance to address pooled oil and sheen. Operations and maintenance will consist of an absorbent boom and/or containment boom strategies as necessary;
- Isolated pooled oil area near on the right descending overbank just downstream of mile marker 10.5 will likely require operations and maintenance.

Segment 10.75 has reached the operational endpoint for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

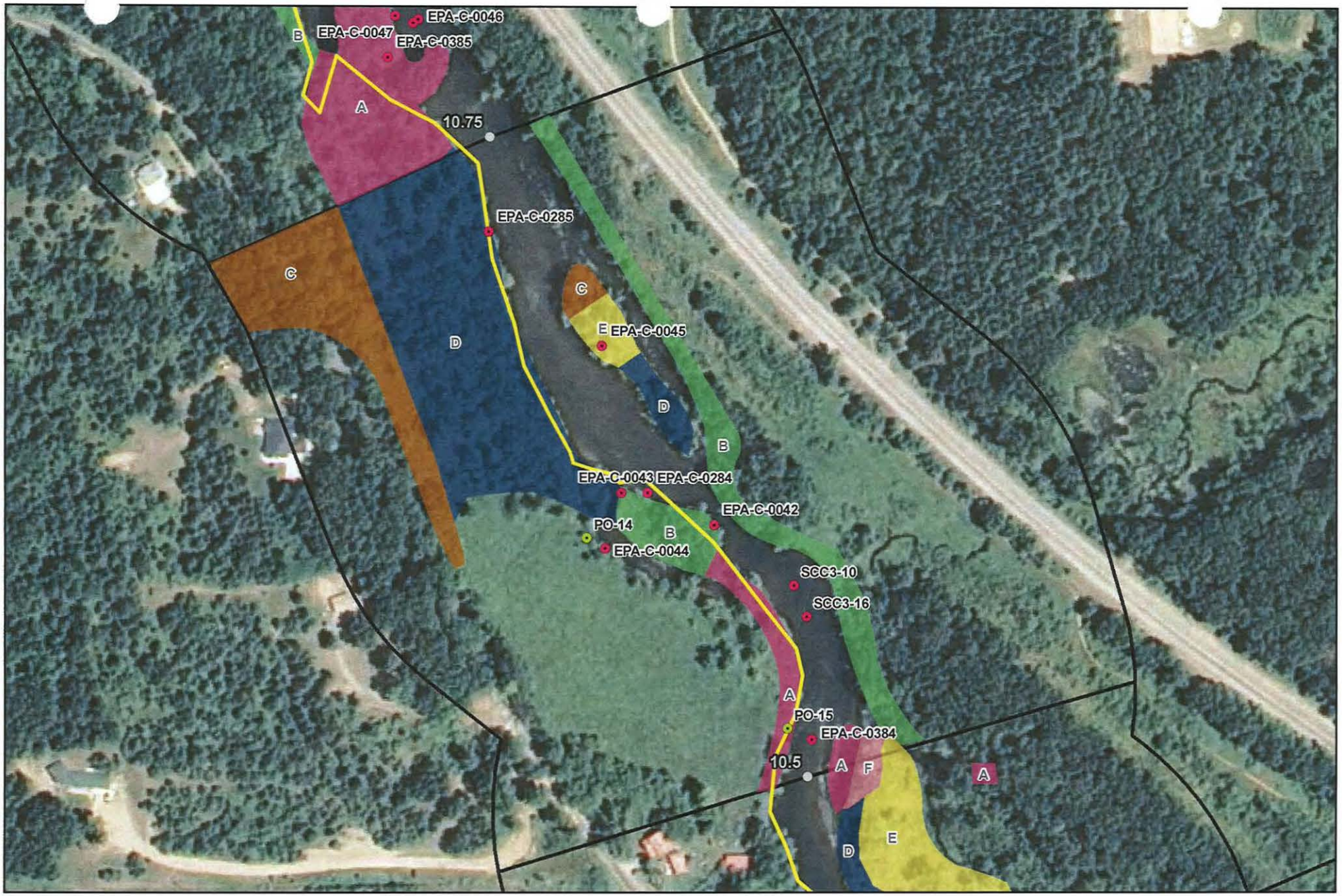
- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B B/C C D E F G H NO OIL ZONE

Division C: Mile Marker 10.5-10.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

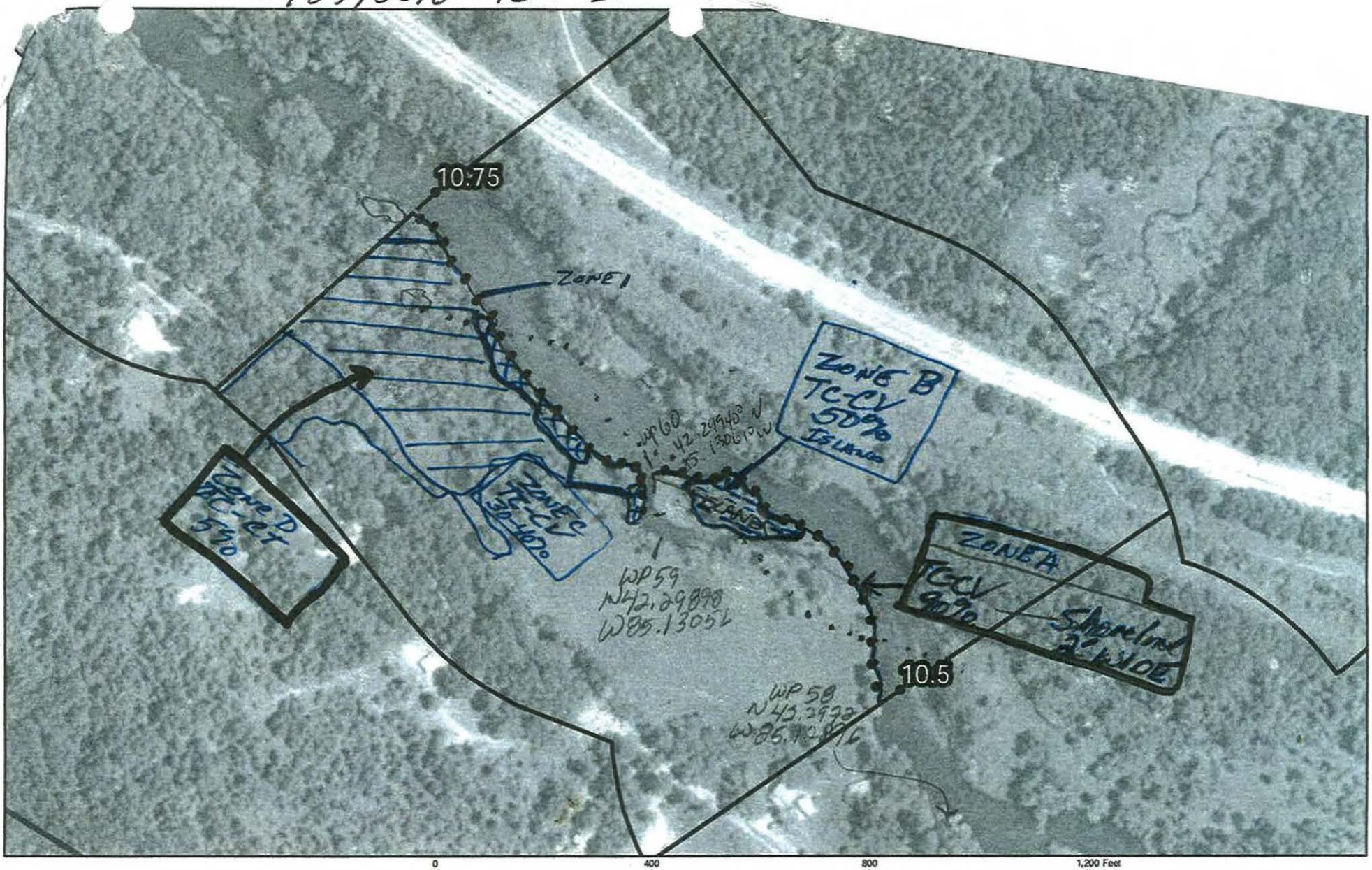
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 10.5-10.75 Left Bank While Looking Downstream										
EPA-C-0284	Shoreline	SCAT T1 8/27/10	Oil surface film is collecting in channel behnind island. LDB behind island at shoreline has very little oil.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.29940	-85.13061
EPA-C-0285	Shoreline	SCAT T1 8/27/10	way point 61 marks a ~30 ft x 30 ft oil patch with >60% distribution (42.30021 deg N, 85.13221 deg W.) Recommend manual vegetation removal in this spot.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30064	-85.13165
EPA-C-0042	Main Channel	SCAT T1 8/14/10	WP67 - tree roots heavily impacted					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29925	-85.13018
EPA-C-0043	Main Channel	SCAT T1 8/14/10	WP68 - sediment & vegetation bad					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29940	-85.13078
EPA-C-0044	Shoreline/ Overbank	SCAT T1 8/17/10	Pooled oil and heavily coated vegetation					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29913	-85.13088
SCC3-10	Shoreline	Shoreline Assessment	●		●		Bank oiling is high. Possible access through private property. High volume flush.		42.29897	-85.12967

8/27/2010 REVISED



8/27/10 Team 1

LDB

- QuartermileMarkers
- Shoreline
- River_QuarterMiles
- Divisions

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 48

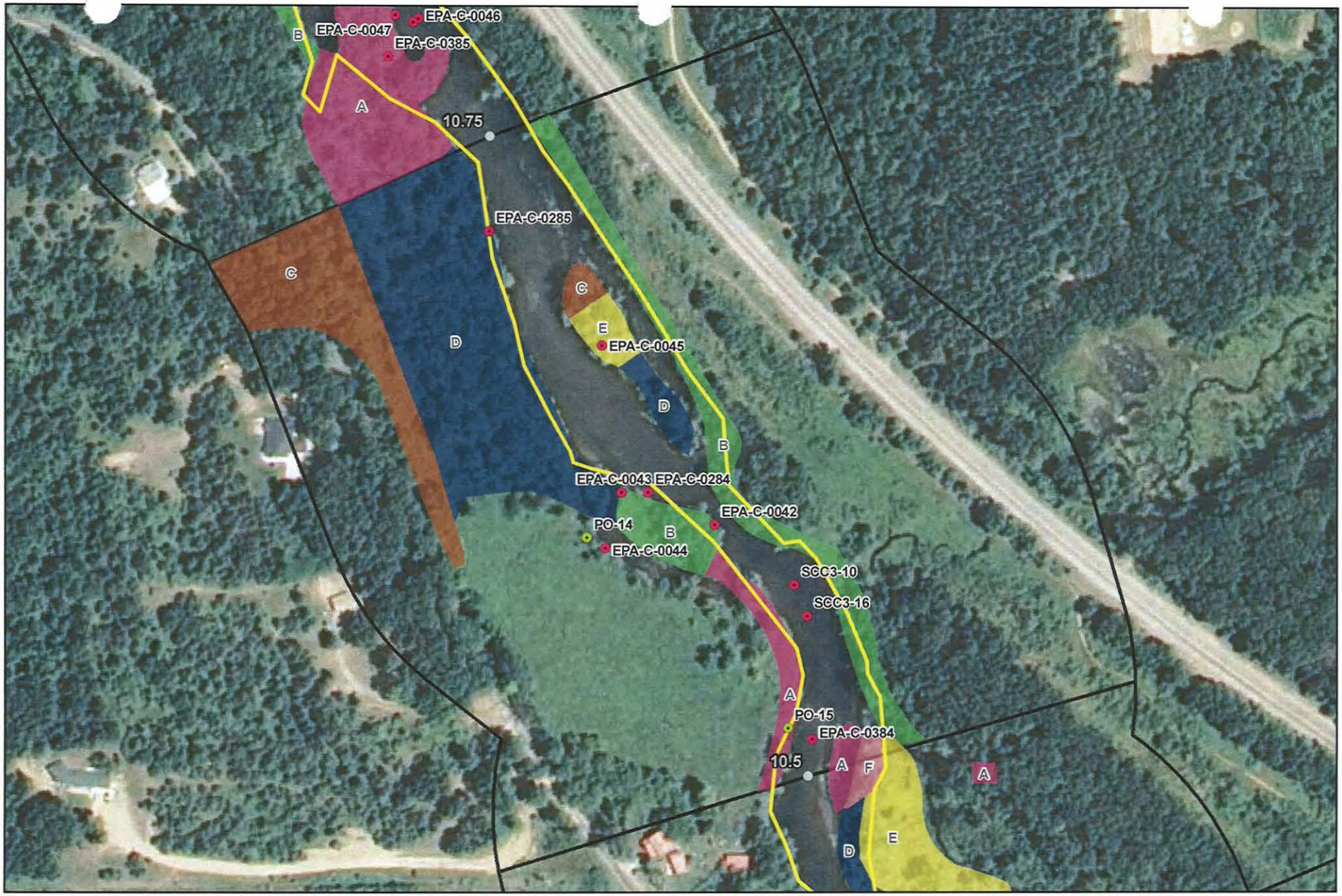
ENTRIX
Down to Earth, Down to Business

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 10.5-10.75 Island										
EPA-C-0384	Shoreline		Sparse oiled vegetation along shoreline of island. On the east end of the island, sheen was noted while walking through the water					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29823	-85.12954
EPA-C-0045	Shoreline	SCAT T1 8/18/10	Oil located on east point of island, major surface residue and some pooled oil.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30010	-85.13092





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 10.5-10.75 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

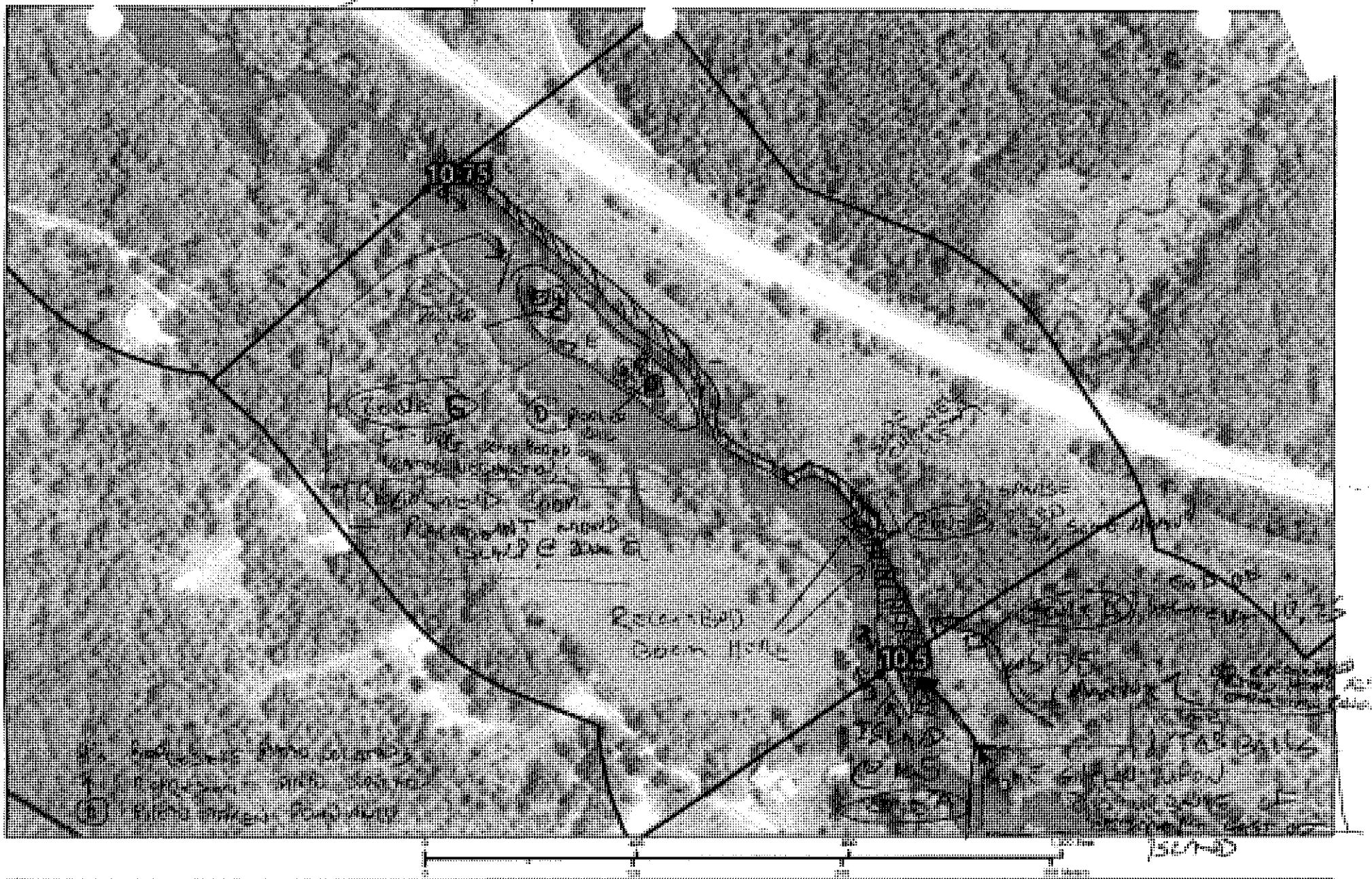
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

SCAT TEAM #3 8/22/12



SHORELINE CLEANUP PLAN - SEGMENT SC01
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 10.5-10.75 Right Bank While Looking Downstream										
SCC3-16	Shoreline	Shoreline Assessment	●		●		High volume flush. Grass line oiled - moderate to heavy in floodplain.		42.29882	-85.12958





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 10.5-10.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

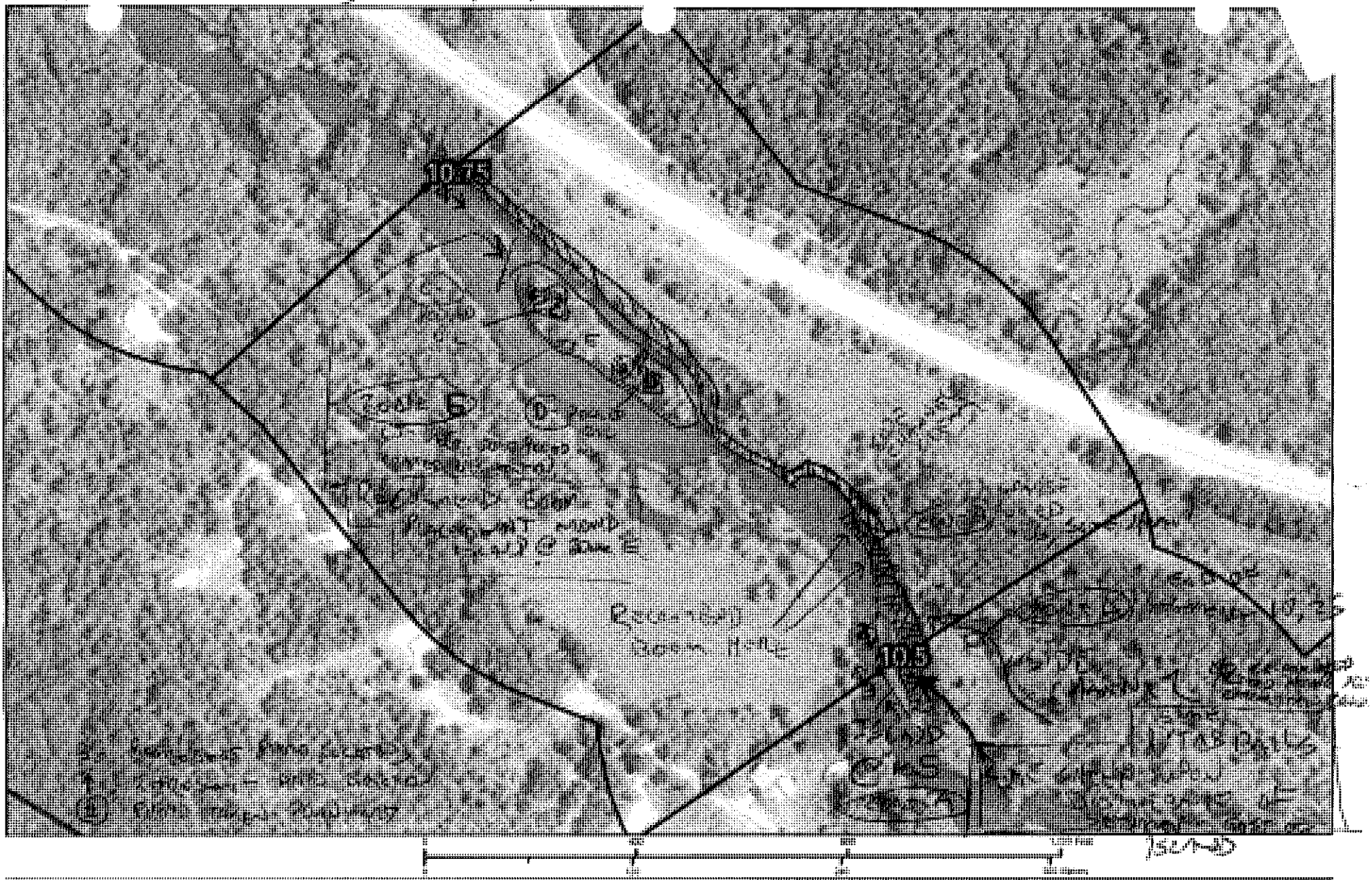
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

SCAT Team #3 3/26/12



SHORELINE CLEANUP PLAN - SEGMENT SC01
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

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Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 09-19-10 Time: AM / PM

Operations Division: C Segment ID: From 10.50 Start MP to End MP 10.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recommendations

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recommendations

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recommendations

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recommendations

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-19-10 Time: AM / PM

Operations Division: C Segment ID: From 0.5 Start MP to End MP 0.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/ Cloud

Field Inspection Team

~~EPA Inspector:~~

Enbridge Inspector: David Reeves

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 9 areas of concerns from the SCAT report
Clean up needed: Flushing, Coated Vegetation, debris removal, Pooling.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

Inspected 9 areas from the SCAT report. Clean up all complete according to the recommendation methods.

Punchlist Items Identified

☑ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release ..ident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 10.5-10.75 Left Bank While Looking Downstream											
✓ EPA-C-0284	Shoreline	SCAT T1 8/27/10	Oil surface film is collecting in channel behnind island. LDB behind island at shoreline has very little oil.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.29940	-85.13061	(Y) / N
EPA-C-0285	Shoreline	SCAT T1 8/27/10	way point 61 marks a ~30 ft x 30 ft oil patch with >60% distribution (42.30021 deg N, 85.13221 deg W.) Recommend manual vegetation removal in this spot.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30064	-85.13165	(Y) / N
✓ EPA-C-0042	Main Channel	SCAT T1 8/14/10	WP67 - tree roots heavily impacted					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29925	-85.13018	(Y) / N
✓ EPA-C-0043	Main Channel	SCAT T1 8/14/10	WP68 - sediment & vegetation bad					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29940	-85.13078	(Y) / N
EPA-C-0044	Shoreline/ Overbank	SCAT T1 8/17/10	Pooled oil and heavily coated vegetation					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29913	-85.13088	(Y) / N
✓ SCC3-10	Shoreline	Shoreline Assessment	●		●		Bank oiling is high. Possible access through private property. High volume flush.		42.29897	-85.12967	(Y) / N

Printed Team Member Names: Rose O., ERNIE S, Glenn V.W.
Date:
Comments:

Recommend: Frequent changing of pampers & sorbent booms as part of monitoring.

Based on original SCAT Recommendations, actions to remove oiled vegetation have been undertaken, however Sediment/Soil remain AND IS to be addressed by the Submerged Oil Task Force

PO-14 (8/16) Pooled oil, remove pooled oil 42.299 -85.131 (Y) / N

Enbridge Pipeline Release ...ident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 10.5-10.75 Island											
EPA-C-0384	Shoreline		Sparse oiled vegetation along shoreline of island. On the east end of the island, sheen was noted while walking through the water					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.29823	-85.12954	(Y) / N
* EPA-C-0045	Shoreline	SCAT T1 8/18/10	Oil located on east point of island, major surface residue and some pooled oil.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30010	-85.13092	(Y) N

Printed Team Member Names: ERNIE S., ROSS D., GLENN UW
Date:
Comments:

*EPA-C-045 - See O&M form prepared for this location. See recommendations for O&M.

ISLAND HAS SIGNIFICANT tarred and saturated soil (>50%) DAVE PETERS AND DOUG BENNETT INDICATED THIS ISLAND IS to be addressed by Submerged oil Task Force

Oil delineation area per floodplain data
Area may be heavily oiled on island, data not collected during SCAT
42.30000 -85.13100

Enbridge Pipeline Release ...ident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 10.5-10.75 Right Bank While Looking Downstream											
SCC3-16	Shoreline	Shoreline Assessment	●		●		High volume flush. Grass line oiled - moderate to heavy in floodplain.		42.29882	-85.12958	(Y) N

Printed Team Member Names: Glenn
Date:
Comments:

Sorbent boom at MP 10.5 marker in channel on RDB is saturated; needs to be changed.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C Segment ID: From 10 50 Start MP to End MP 10 75 Segment Length: 0.25 mile

1. SCAT ☒

2. Clean up ☒

3. Inspection

[signature] 9-19-10 Enbridge
Signature (date)

[signature] 9-19-2010 EPA
Signature (date)
Eugene Dennis, EPA OSC

4. SCAT Reassessment

[signature] 9/20/10 Enbridge
Signature Glenn Vande Water (date)

[signature] 9/20/10 EPA
Signature Ross DEL ROSARIO (date)

[signature] 9/20/10 MDNRE
Signature (date)
Ernest Sarkipato

5. EPA

[signature] 9/23/10 EPA Division Supervisor
Signature Jordan Garrard (date)

O+M needed on left Bank @ 10.5 SCAT Point EPA-C-0044

Appendix E
Photographs

Field Photo Log – Segment 10.75



Photo 0953 – Facing north at right descending bank near SCC3-16.



Photo 0955 – Facing northeast at island.

Field Photo Log – Segment 10.75



Photo 0957 – Facing southeast at island near EPA-C-0045.



Photo 0960 – Facing north at right descending bank.

Field Photo Log – Segment 10.75



Photo 0962 – Facing south at left descending bank near EPA-C-0285.



Photo 0964 – Facing southeast at left descending overbank in zone D.

Field Photo Log – Segment 10.75



Photo 0965 – Facing southeast at left descending overbank in zone C.



Photo 0967 – Facing southeast at left descending overbank in zone A.

Field Photo Log – Segment 10.75



Photo 0968 – Facing southeast at island near EPA-C-0284/EPA-C-0043 (zone B).



Photo 0969 – Facing east at left descending bank near EPA-C-0044.

Field Photo Log – Segment 10.75



Photo 0971 – Facing northwest at island near EPA-C-0042 (zone B).



Photo 0972 – Facing north at left descending bank in zone A.

Field Photo Log – Segment 10.75



Photo 0973 – Facing southeast at left descending bank near SCC3-10.



Photo 0974 – Facing southeast at left descending bank near EPA-C-0042.

Field Photo Log – Segment 10.75



Photo 0977 – Facing north at left descending bank in zone A.

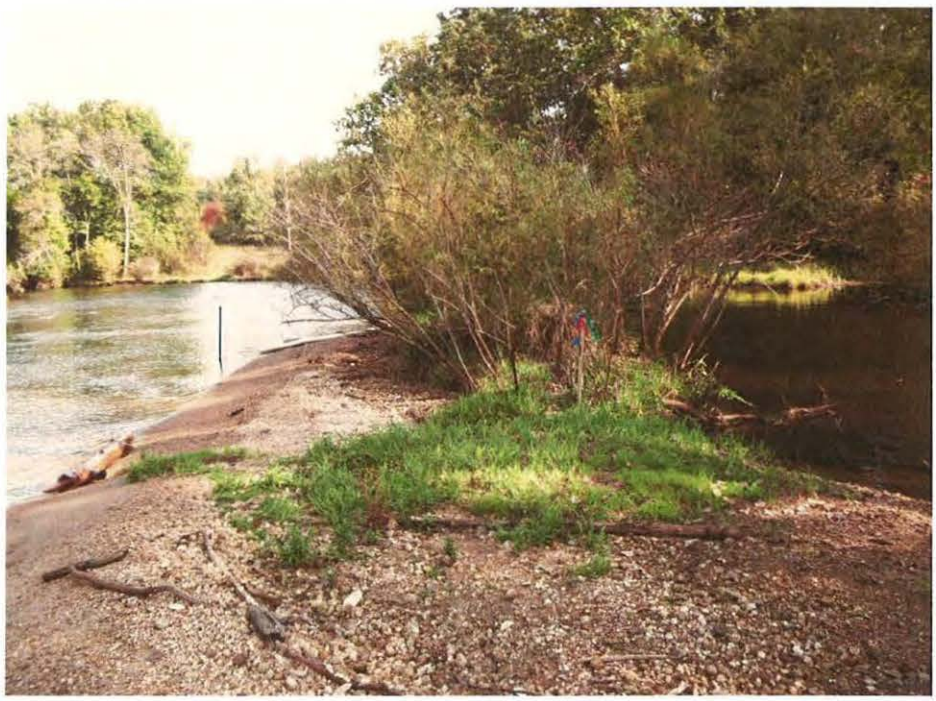


Photo 0987 – Facing north at island near EPA-C-0384.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 11.0 – MP 10.75 to 11.0

Enbridge Energy

September 21, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 11.0 had light levels of oil staining along the left descending bank, transitioning to heavy levels of oil staining just before reaching MP 11.0. Oiled overhanging vegetation, oiled roots and debris were observed on the left descending bank. The shoreline and overbank areas of the left descending bank contained areas of pooled oil. Special consideration was mentioned for small pools of oil present in mudflats and ephemeral pools within the floodplain forest that contained several areas of pooled oil, subsurface tar, and coated vegetation. The islands contained major banding of trees/vegetation, saturated soil, and tar balls were apparent upon the disturbance of sediment. Oil appeared to become thicker downstream. The eastern end of the island was nearly 80% covered, with oil coated inland grasses/vegetation and an area of pooled oil was observed in the center of the island. In addition, tarred vegetation, multiple areas of fresh/pooled oil, and surface residue were present on the island. Mousse-covered vegetation was located on a large rock, located at EPA-C-0289. Tree bases throughout the island were heavily tarred but the oil residue did not readily remove from the surface. The right descending bank had light levels of oil staining throughout the segment. There were multiple areas of pooled oil, sparse oil stains beneath the grass and overhanging vegetation along the right descending bank. Large pools of heavy oil were observed at about 5'-10' into the overbank areas of the right descending bank. Based on the original SCAT recommendations, actions to remove oiled vegetation and surface oil have been undertaken, however, saturated soil remains. Areas with significant saturated soils are being turned over to the submerged oil task force.

Actions

The shoreline clean-up activities within Segment 11.0 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- High pressure cold water wash on oil covers (oil.0.1cm to <1cm think)
- Vegetation removal from the waterline, leaving roots intact and woody plants greater than 2" in diameter;
- Removal of pooled oil using portable vacuum/absorption techniques (snares/pom-poms, sorbent pads);
- Cut, bag, and removal of vegetation from around these pools to up to 10' as needed to detect other pools of oil within area;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Manual removal of oiled debris;

- Absorbent pad placement in saturated soil;
- Pooled oil removal.
- Mobilize and capture oil with boom or sorbent material;
- Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) and absorption methods on larger rocks and boulders with downstream snare and boom capture.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil, oiled woody vegetation, and pooled oil in zone C of the left descending bank
- Oiled soil and oiled woody vegetation in zone A of the island.
- Oiled soil and oiled woody vegetation in zone B of the right descending bank
- Oiled woody vegetation in and near zone D of the right descending bank
- Oiled woody vegetation and debris in zone B of the right descending bank.
- Oiled Debris at right descending bank near EPA-C-0052.

Segment 11.0 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

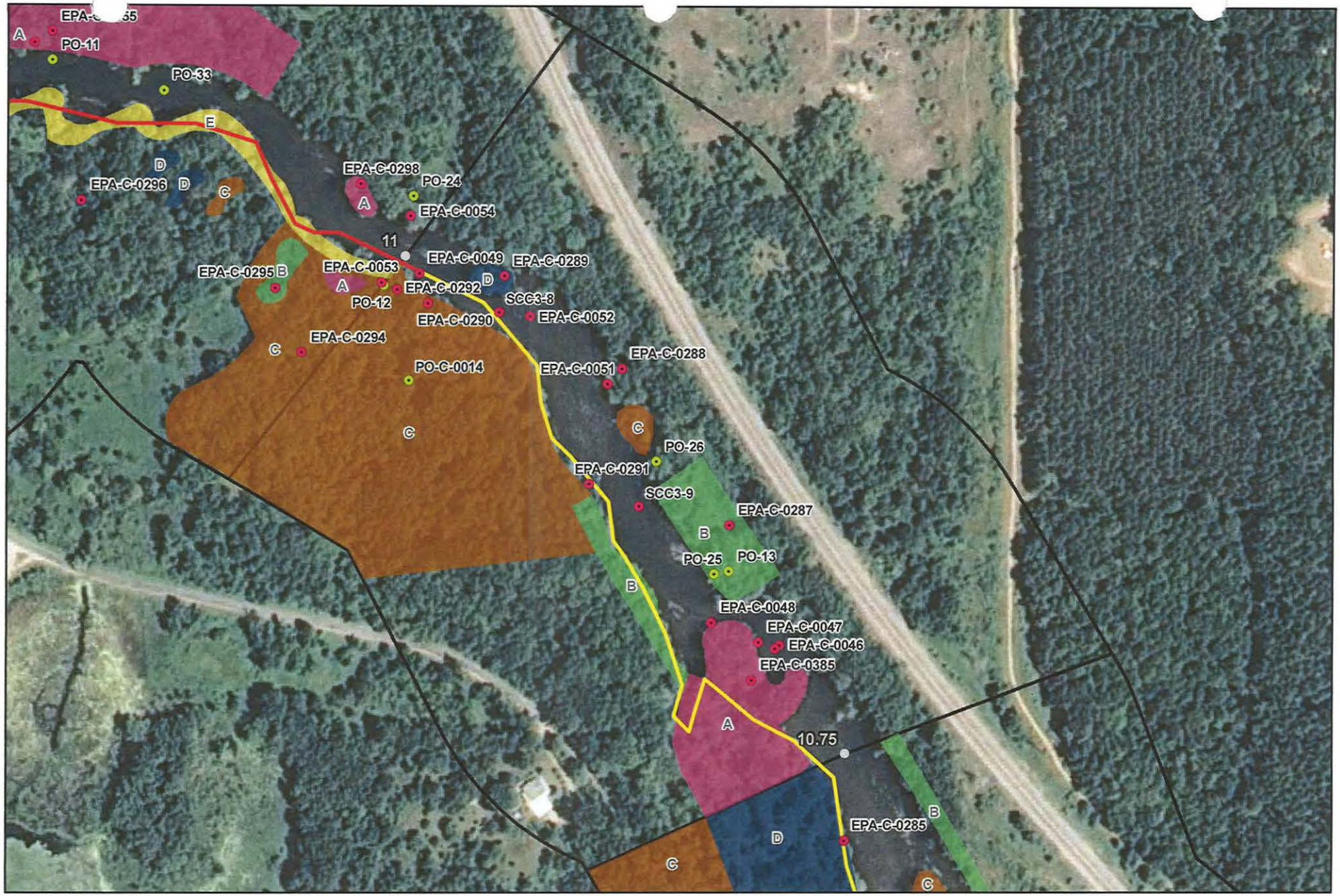
- **Appendix E: Photographss**
  - Provides visual documentation of EPA GPS waypoints addressed

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Inc. ..nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 10.75-11 Left Bank While Looking Downstream										
SCC3-8	Shoreline	Shoreline Assessment	●				High volume flush.		42.30337	-85.13412
SCC3-9		Shoreline Assessment	●	●	●	●	Shoreline oiling is moderate to heavy. Small amount of pooled oil.		42.30237	-85.13312
EPA-C-0290	Shoreline	SCAT T1 8/27/10	Lots of oiled overhanging vegetation; bank oiled into roots of vegetation. First walk of segment, ~ 10 ft in, very little patchy oil on vegeation, <5%, verified farther upland nothing.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30341	-85.13462
EPA-C-0291	Shoreline	SCAT T1 8/27/10	sporadic oiled vegetation. First walk of segment, ~ 10 ft in, very little patchy oil on vegeation, <5%, verified farther upland nothing.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30248	-85.13347
EPA-C-0292	Shoreline	SCAT T1 8/27/10	Hot spot pool at way point 66. ephemeral pools within floodplain forest; several pooled oil spots and subsurface tar, with coated vegetation. Despite low percent oil cover, small oil pool on mudflats should be addressed. First walk of segment, ~ 10 ft in, very little patchy oil on vegeation, <5%, verified farther upland nothing.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30341	-85.13462
EPA-C-0293	Shoreline	SCAT T2 8/28/10	Remove Debris. GPS waypoint (WP) @ zone start. photo 496 is looking downstream from milepost 11.0. isolated coat (stained shoreline and over bank throughout but very small isolated patches-not zoned not continuous)					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30348	-85.13484
EPA-C-0047	Island	SCAT T1 8/14/10	pooled oil in center of island. Inland grasses/vegetation, coated. Eastern end of island has the worst of it (80% covered)					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30167	-85.13227
EPA-C-0046	Main Channel	SCAT T1 8/14/10						* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30165	-85.13212





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 10.75-11
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

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Coordinate System: NAD 1983 State Plane Michigan South Feet

8/27/2010 TEAM1



0 400 800 1,200 Feet

0 120 240 360 Meters

QuartermileMarkers
Shoreline
River_QuarterMiles
Divisions

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 48

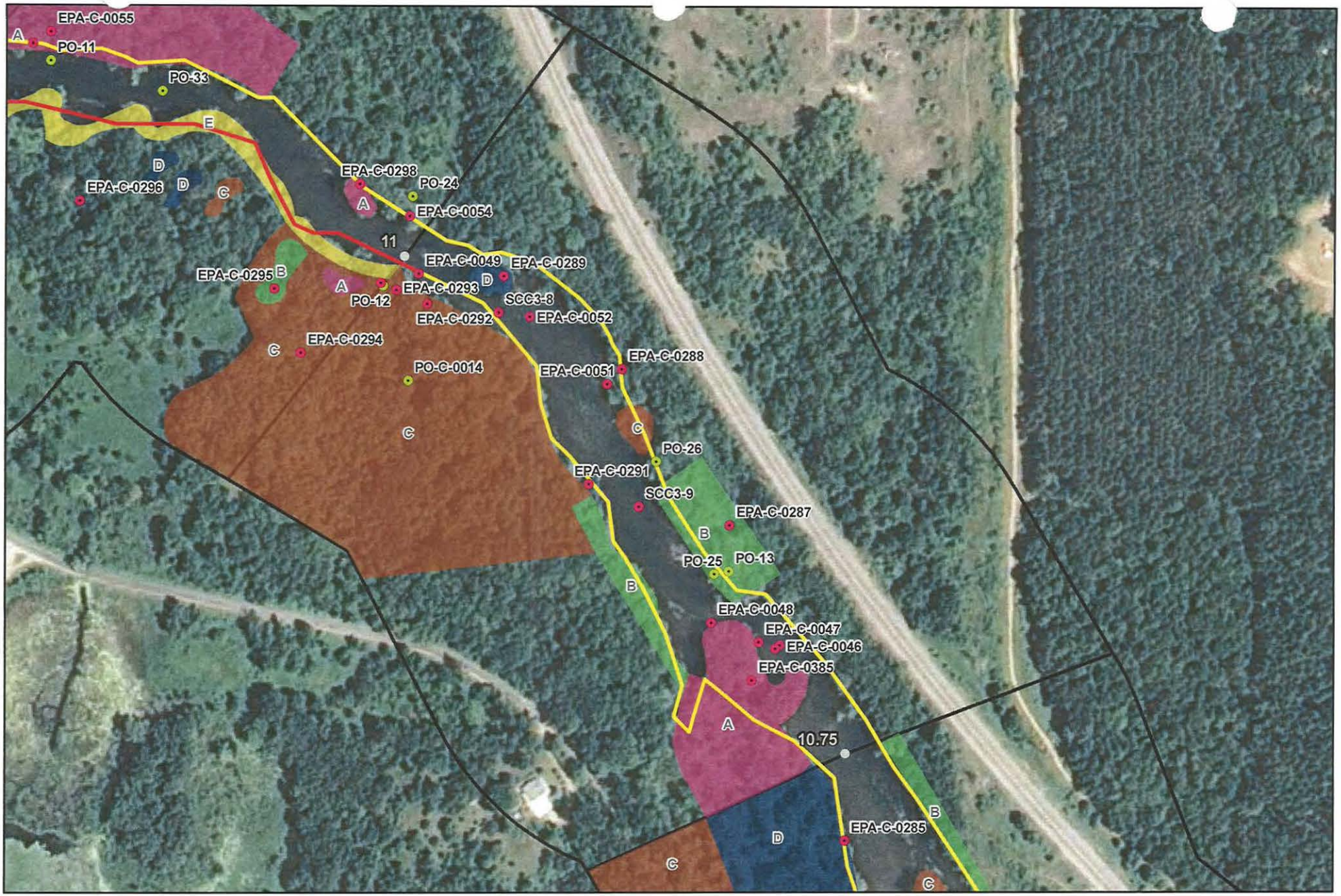
ENTRIX
Down to Earth. Down to Business.

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGA[illegible] FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 10.75-11 Island										
EPA-C-0385	ISL		Multiple pools of oil throughout zone.					Low pressure, cold water flush of tree clump on SE corner.	42.30147	-85.13231
EPA-C-0048	Shoreline/ Overbank	SCAT T1 8/17/10	Pooled oil on the island interior					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30177	-85.13260
EPA-C-0050	Shoreline	SCAT T1 8/18/10	Entire island impacted, major area on east point. Tar on vegetation with pooled oil underneath.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30163	-85.13215
EPA-C-0051	Shoreline	SCAT T1 8/18/10	Small island with small patches of fresh, pooled oil and some surface residue.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30300	-85.13335
EPA-C-0052	Shoreline	SCAT T1 8/18/10	Major banding and surface residue on east, upriver, point of island					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30335	-85.13390





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 10.75-11 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

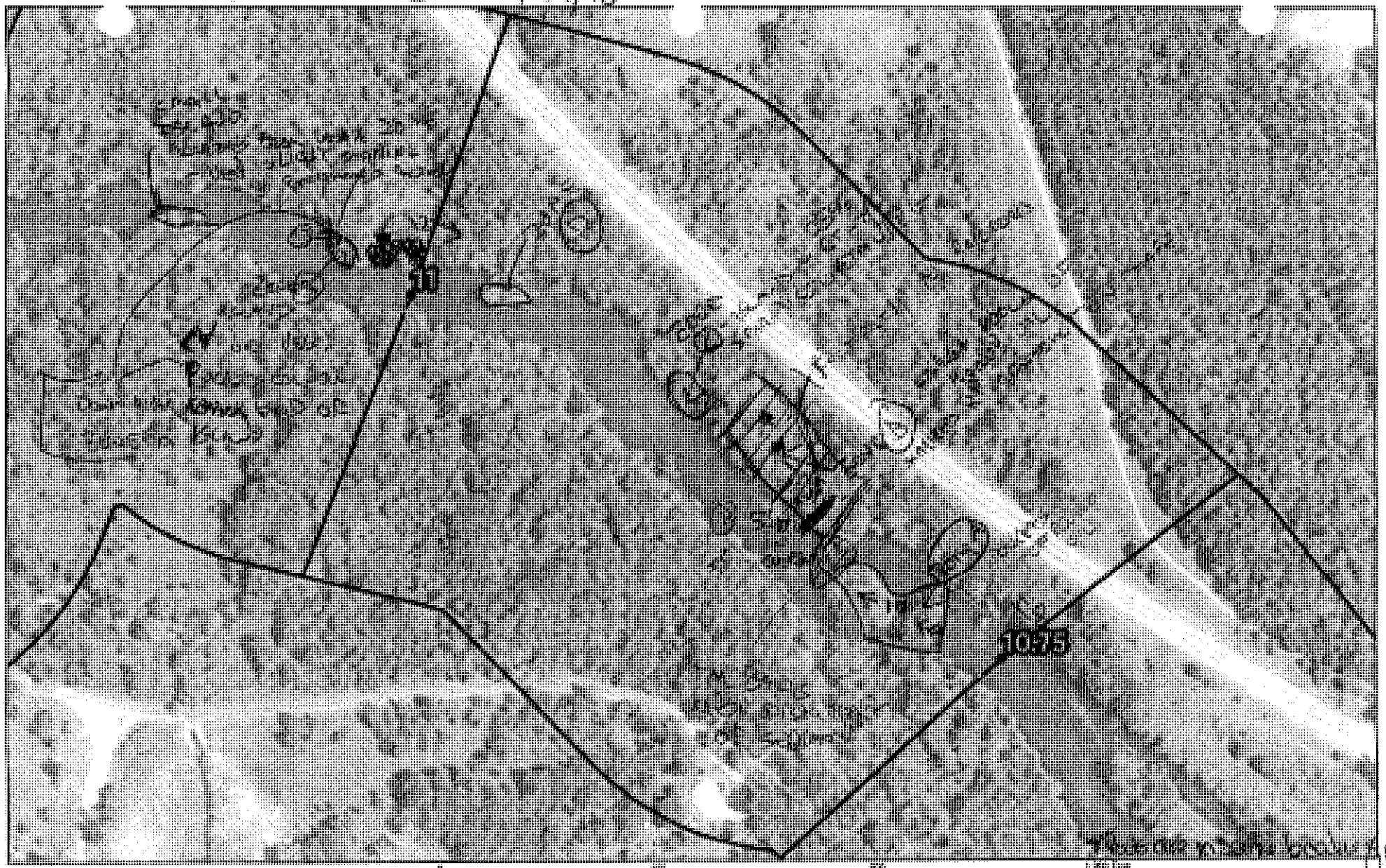
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

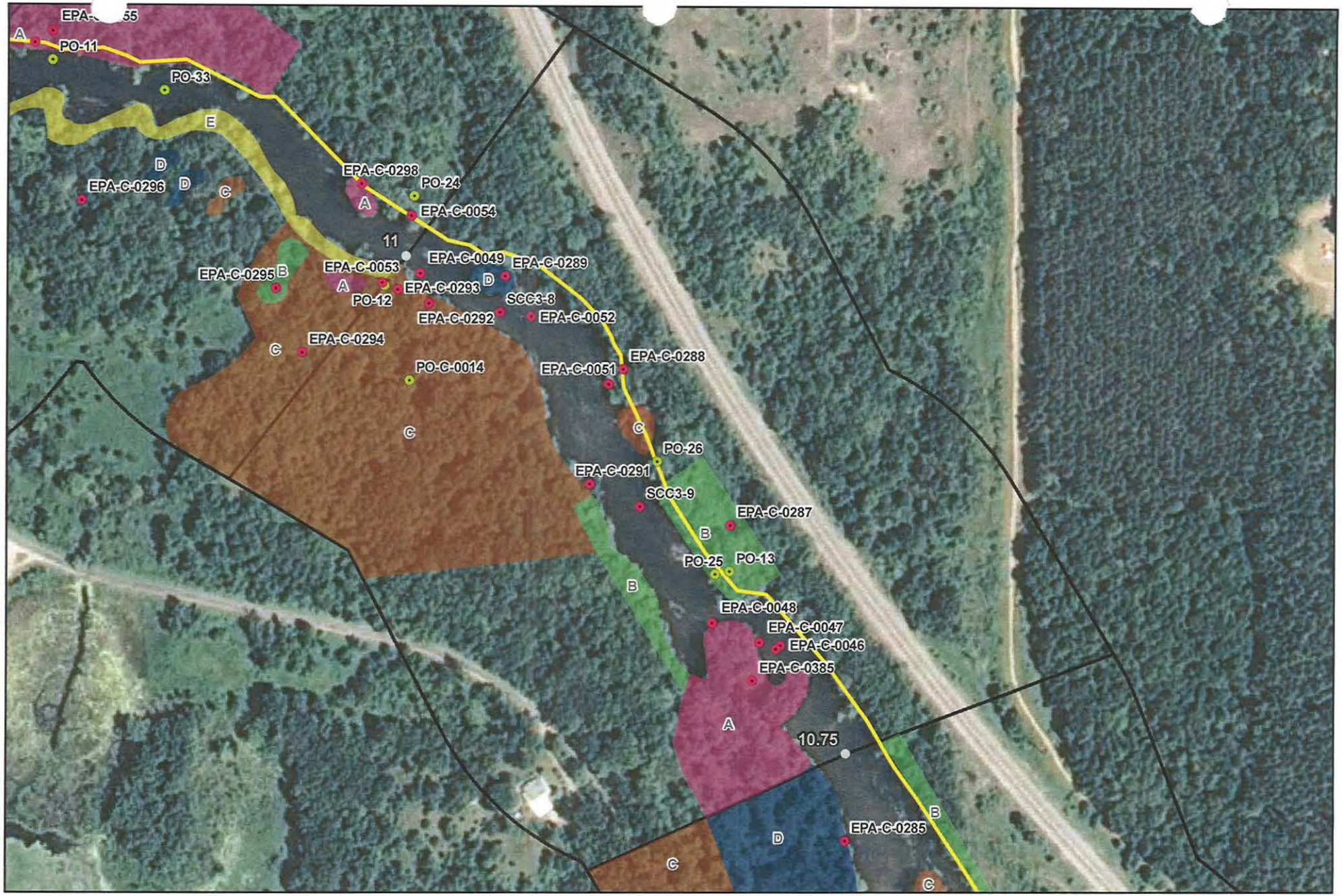
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet


SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM
Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill
ENTRIX
www.entrix.com

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 10.75-11 Right Bank While Looking Downstream										
EPA-C-0287	Shoreline	SCAT T3 8/28/10	Large pools of heavy oil throughout zone. Sparce oils stains under grass between zone b and the island					In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil.	42.30227	-85.13248
EPA-C-0288	Shoreline	SCAT T3 8/28/10	Small island with small stains that need to be removed. Sparce oils stains under grass between zone b and the island					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30308	-85.13325
EPA-C-0289	Shoreline	SCAT T3 8/28/10	island, oil becomes thicker downstream. moose tied up in vegetation on upstream side of island. Sparce oils stains under grass between zone b and the island					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30356	-85.13408





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 10.75-11
Right Bank While Looking Downstream

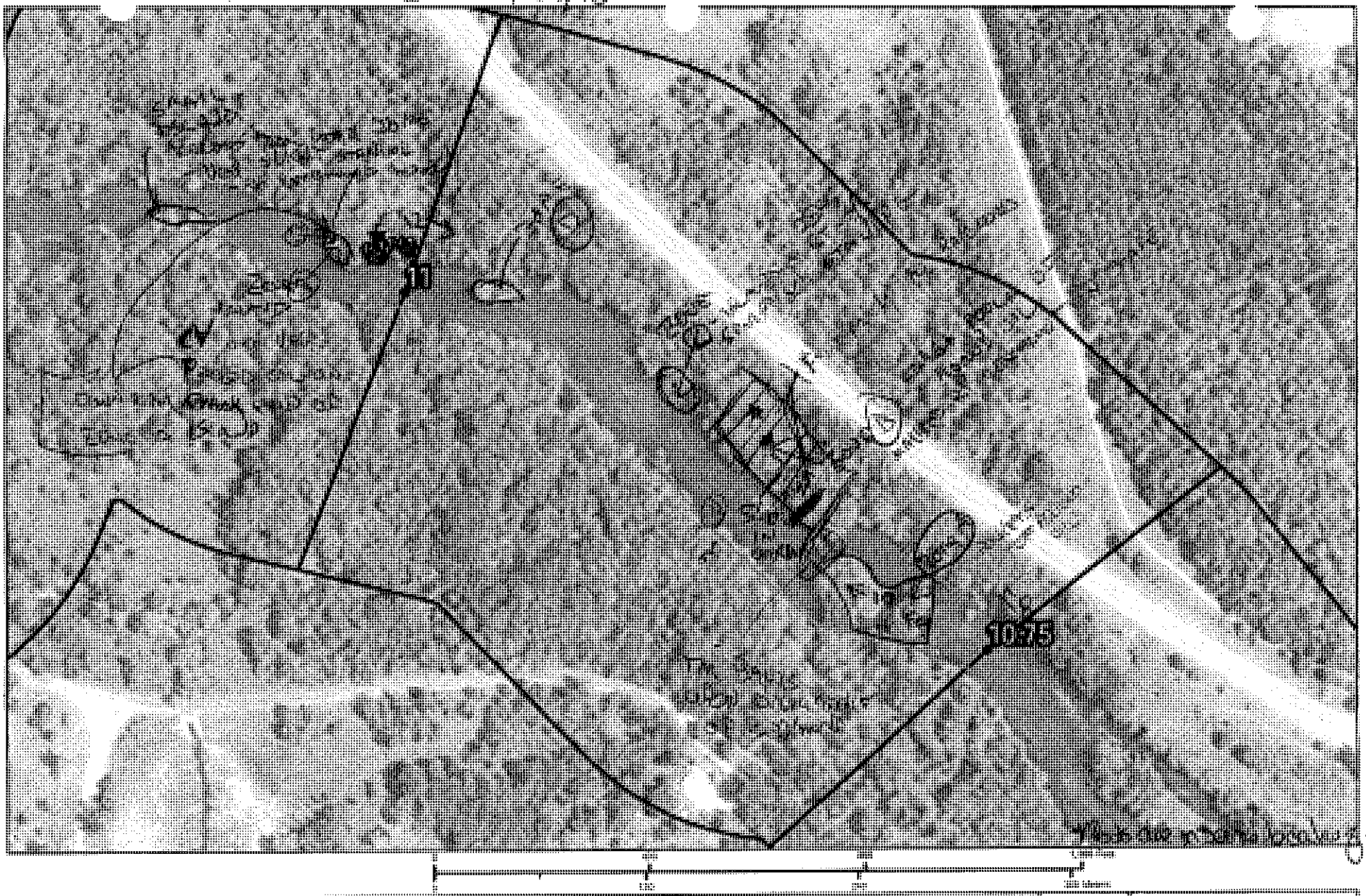
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet


SCC1
SCC2
SCC3
SCC4
SCC5
SCC6
SCC7
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SCC13
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SCC24
SCC25
SCC26
SCC27
SCC28
SCC29
SCC30
SCC31
SCC32
SCC33
SCC34
SCC35
SCC36
SCC37
SCC38
SCC39
SCC40
SCC41

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/14/12 **Time:** AM / PM

Operations Division: C **Segment ID: From** 10.75 **Start MP to End MP** 11.03 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Jeff Reynolds

Division Supervisor(Contractor): Jim Klinefelter

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

all SCAT points verified & approved

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

all SCAT points verified & approved.

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

all SCAT points verified & approved

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

all SCAT points verified & approved

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 09/14/10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 10.75 **Start MP to End MP** 11.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): HARRY BICE

SCAT Reviewed – Description of Clean Up Required

All SCAT items were reviewed.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work completed.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release .. Jent - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 10.75-11 Left Bank While Looking Downstream											
SCC3-8	Shoreline	Shoreline Assessment	●				High volume flush.		42.30337	-85.13412	Y / N
SCC3-9		Shoreline Assessment	●	●	●	●	Shoreline oiling is moderate to heavy. Small amount of pooled oil.		42.30237	-85.13312	Y / N
EPA-C-0290	Shoreline	SCAT T1 8/27/10	Lots of oiled overhanging vegetation; bank oiled into roots of vegetation. First walk of segment, ~ 10 ft in, very little patchy oil on vegeation, <5%, verified farther upland nothing.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30341	-85.13462	Y / N
EPA-C-0291	Shoreline	SCAT T1 8/27/10	sporadic oiled vegetation. First walk of segment, ~ 10 ft in, very little patchy oil on vegeation, <5%, verified farther upland nothing.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30248	-85.13347	Y / N
EPA-C-0292	Shoreline	SCAT T1 8/27/10	Hot spot pool at way point 66. ephemeral pools within floodplain forest; several pooled oil spots and subsurface tar, with coated vegetation. Despite low percent oil cover, small oil pool on mudflats should be addressed. First walk of segment, ~ 10 ft in, very little patchy oil on vegeation, <5%, verified farther upland nothing.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30341	-85.13462	Y / N
EPA-C-0293	Shoreline	SCAT T2 8/28/10	Remove Debris. GPS waypoint (WP) @ zone start. photo 496 is looking downstream from milepost 11.0. isolated coat (stained shoreline and over bank throughout but very small isolated patches-not zoned not continuous)					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30348	-85.13484	Y / N
EPA-C-0047	Island	SCAT T1 8/14/10	pooled oil in center of island. Inland grasses/vegetation, coated. Eastern end of island has the worst of it (80% covered)					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30167	-85.13227	Y / N
EPA-C-0046	Main Channel	SCAT T1 8/14/10						* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30165	-85.13212	Y / N

Printed Team Member Names:

Date:

Comments: * SEE O&M SHEET - Recommend monitoring exposed soils that have occasional saturated areas

Glenn Vance Water 9/19/10

Eduardo Rovira 9/19/10

Ernie Sarkipato 9/19/10

ABSORBANT PADS PUT IN SATURATED SOIL IN 11.25 SEGMENT ABUTTING 11.0 ADJACENT RIVER. SEE O&M SHEET

PO-0014 (8/18) Pooled oil, remove pooled oil 42.303 -85.135 Y / N

PO-0012 (8/16) Pooled oil, remove pooled oil 42.304 -85.135 Y / N

[signature] 9-24-10

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 10.75-11 Right Bank While Looking Downstream											
EPA-C-0287	Shoreline	SCAT T3 8/28/10	Large pools of heavy oil throughout zone. Sparce oils stains under grass between zone b and the island					In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil.	42.30227	-85.13248	Y / N
EPA-C-0288	Shoreline	SCAT T3 8/28/10	Small island with small stains that need to be removed. Sparce oils stains under grass between zone b and the island					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30308	-85.13325	Y / N
EPA-C-0289	Shoreline	SCAT T3 8/28/10	island, oil becomes thicker downstream. moose tied up in vegetation on upstream side of island. Sparce oils stains under grass between zone b and the island					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30356	-85.13408	Y / N

Printed Team Member Names:

Date: Glenn VanderWater 9/19/10

Comments: LARGE RACK

Eduardo Rivera 9/19/10

Ernie Sanyoto 9/19/10

Based on the original SCAT Recommendations actions to remove oiled vegetation and surficial oil have been undertaken, however saturated soils remain, and according to Dave Pesses (NRG) and Doug Bennet (Enbridge) areas with significant saturated soils are being turned over to the submerged oil task force. SEE O&M SHEET

PO-0013 (8/16) Pooled oil, remove pooled oil 42.302 -85.132 Y / N
PO-0025 (8/19) Pooled oil, remove pooled oil 42.302 -85.133 Y / N
PO-0026 (8/19) Pooled oil, remove pooled oil 42.303 -85.133 Y N

fg E. B. [signature] 9-24-10

Enbridge Pipeline Release . Jent - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 10.75-11 Island											
EPA-C-0385	ISL		Multiple pools of oil throughout zone.				①	Low pressure, cold water flush of tree clump on SE corner.	42.30147	-85.13231	Y (N)
EPA-C-0048	Shoreline/ Overbank	SCAT T1 8/17/10	Pooled oil on the island interior				②	* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30177	-85.13260	(Y) / N
EPA-C-0050	Shoreline	SCAT T1 8/18/10	Entire island impacted, major area on east point. Tar on vegetation with pooled oil underneath.				②	* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30163	-85.13215	(Y) / N
EPA-C-0051	Shoreline	SCAT T1 8/18/10	Small island with small patches of fresh, pooled oil and some surface residue.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30300	-85.13335	(Y) / N
EPA-C-0052	Shoreline	SCAT T1 8/18/10	Major banding and surface residue on east, upriver, point of island					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30335	-85.13390	(Y) / N

Printed Team Member Names: Glenn Vandehaar 9/19/10 Eduardo Rovira 9/19/10 Ernie Sarlipato 9/19/10

Date:

Comments:

① TREE BASES, STILL HEAVILY TARRED BUT DOES NOT RUB OFF

② = SEE O&M PLAN SHEET

BASED ON THE ORIGINAL SCAT RECOMMENDATIONS, ACTIONS TO REMOVE OILED VEGETATION AND SURFICIAL OIL HAVE BEEN UNDERTAKEN, HOWEVER SATURATED SOILS REMAIN, AND ACCORDING TO DAVE PESSES (NRC) AND DOUG BENNET (ENBRIDGE) AREAS WITH SIGNIFICANT SATURATED SOILS ARE BEING TURNED OVER TO THE SUBMERGED OIL TASK FORCE, SEE O&M SHEET

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From** 10 25 **Start MP to End MP** 11 00 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Matt Bordson 9-18-10 Enbridge
Signature MATT BORDSON (date)

Eugene Dennis 9-18-2010 EPA
Signature Eugene Dennis, EOA OSC (date)

4. **SCAT Reassessment**

Glenn Vande Walle 9/19/10 Enbridge
Signature Glenn Vande Walle (date)

Eduardo Rovira 9/19/10 EPA
Signature Eduardo Rovira (date)

Ernest Sarkipatt 9/19/10 MDNRE
Signature (date)
ERNEST SARKIPATT

5. **EPA**

9/23/10 EPA Division Supervisor
Signature (date)
Jordan Garrard

Appendix E
Photographs

Field Photo Log – Segment 11.0



Photo 0610 – Facing northwest at right descending bank.



Photo 0614 – Facing southwest at right descending overbank near EPA-C-0287.

Field Photo Log – Segment 11.0



Photo 0615 – Facing southwest at right descending overbank near EPA-C-0287.



Photo 0618 – Facing north at island near EPA-C-0288

Field Photo Log – Segment 11.0



Photo 0620 – Facing northwest at island near EPA-C-0052



Photo 0624 – Facing southeast at left descending in overbank zone C.

Field Photo Log – Segment 11.0



Photo 0627 – Facing east at left descending overbank in zone C.



Photo 0632 – Facing southeast at left descending overbank near EPA-C-0293

Field Photo Log – Segment 11.0



Photo 0637 – Facing southeast at left descending overbank in zone A.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 11.25 – MP 11.0-11.25

Enbridge Energy

September 24, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 11.25 had a heavy level of oil staining throughout the left descending bank. Isolated patches of oil coating were observed along the shoreline and throughout the overbank, as well as pooled oil and oiled vegetation and debris. Pockets of saturated soils were found within interior floodplain areas near mile markers 11.0 and 11.5. Saturated soils were also observed within a silted clay loam towards the upstream portion of the left descending overbank. SCAT teams specifically noted an inland pool of oil, 70 feet by 30 feet in size just east of this area. In addition, an 8 foot by 8 foot area of sheen was detected near the shoreline of the left descending bank mid-segment. During assessment of the island, located in the upstream portion of the segment off the right descending bank, pooled oil and oil covered vegetation were observed. The shoreline of the right descending bank had light levels of oil staining throughout the segment. Although the upstream half of the segment was relatively clean of oil, surface residue and pooled oil were observed on the ground beneath the vegetation, near mile marker 11.0. Sparse areas of oil staining were observed in the emergent wetland further downstream, though it was noted that this entire area was impacted with oil extending into the overbank area.

Actions

Clean up methods required for the pooled oil (100m X 30m) previously referred to was outside the recommended methods at the time of the initial SCAT assessment. The use of mechanical excavation was approved by the EPA and Enbridge and accomplished in accordance with a site specific remediation plan. The shoreline clean-up activities within Segment 11.25 consisted of the following:

- Mechanical removal of pooled oil and saturated soils (air operations);
- Cut and bag low hanging limbs extending over and into the water 2 inches above oiling level;
- Vegetation removal, leaving roots intact and woody plants greater than 2 inches in diameter;
- Manual removal of oiled soil;
- Removal of oiled debris;
- Removal of pooled oil through absorption techniques (sorbent pads).

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled debris and woody vegetation remain along both shorelines, as well as in isolated areas on the left descending overbank;

- Oiled sediment remains on the left descending overbank, mid-segment, and on the right descending bank near mile marker 11.0;
- EPA-C-0054 will be monitored during Operations and Maintenance location;
- Saturated/pooled oil on the right descending bank remains and is to be monitored during Operations and Maintenance;
- Oiled herbaceous vegetation remains in overbank areas south of the river;
- Wetland areas, in the downstream portion of the right descending bank, remain impacted and are to be monitored during Operations and Maintenance. Oiled woody vegetation remains in this area.

Segment 11.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

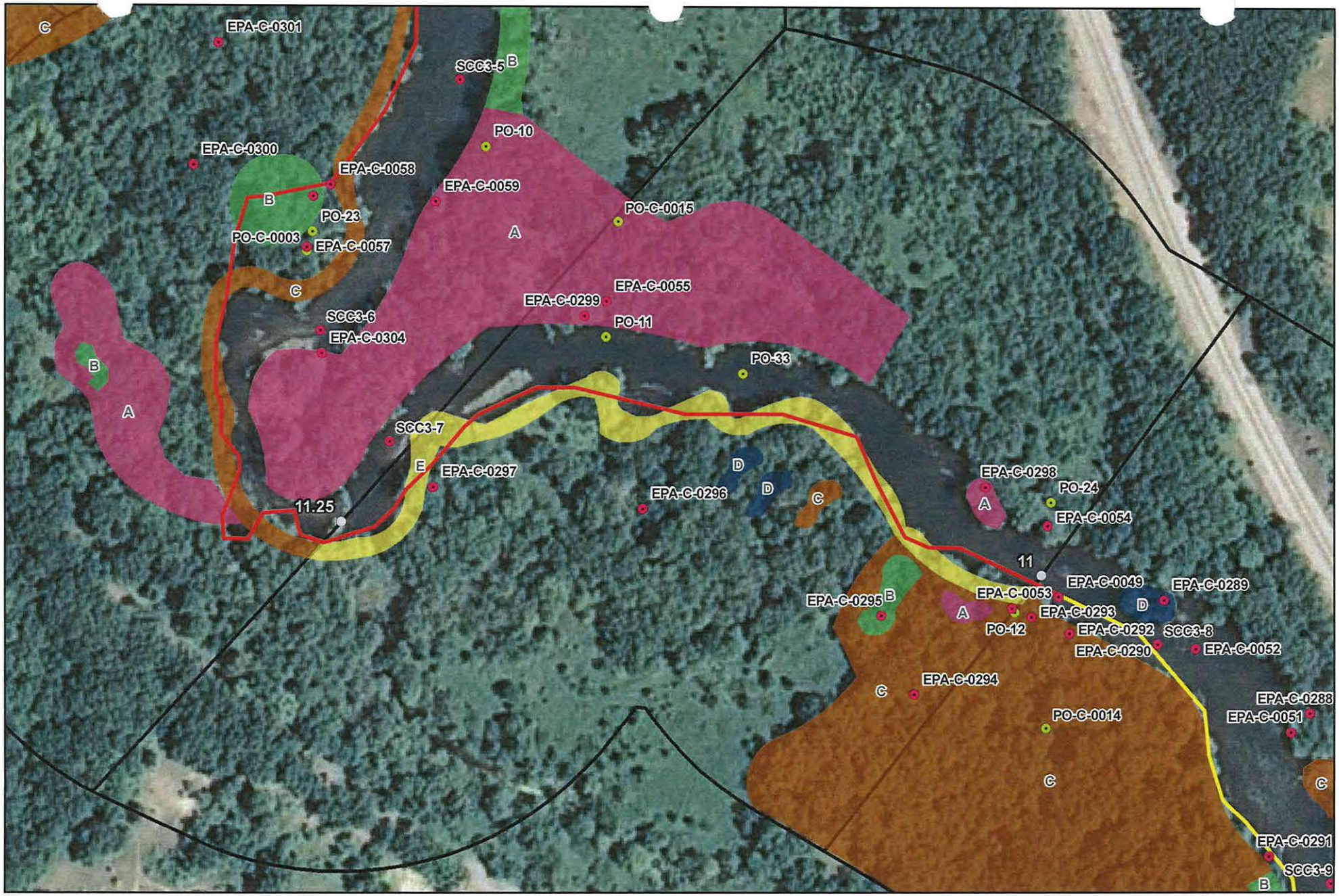
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 11-11.25 Left Bank While Looking Downstream										
EPA-C-0294	Shoreline	SCAT T2 8/28/10	GPS @ beginning of zone B. photo 497 shows pooled oil; photo 498 shows oiled branches/debris. isolated coat (stained shoreline and over bank throughout but very small isolated patches-not zoned not continuous)					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30315	-85.13551
EPA-C-0295	Shoreline	SCAT T2 8/28/10	isolated coat (stained shoreline and over bank throughout but very small isolated patches-not zoned not continuous)					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30348	-85.13570
EPA-C-0296	Shoreline	SCAT T2 8/28/10	GPs at middleof zone two separate pocket5 2nd 70ftW of GPS. isolated coat (stained shoreline and over bank throughout but very small isolated patches-not zoned not continuous)					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30393	-85.13707
EPA-C-0297	Shoreline	SCAT T2 8/28/10	GPs @ end of zone. Linear zone along shoreline oil stained veg throughout. photo 499 shows oiled debris. isolated coat (stained shoreline and over bank throughout but very small isolated patches-not zoned not continuous)					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30401	-85.13826
EPA-C-0053	Main Channel	SCAT T1 8/14/10	WP71 - pool (inland) 70 x 30 ft. - free unweathered oil, EXTREME!					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30352	-85.13495





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 11-11.25
Left Bank While Looking Downstream

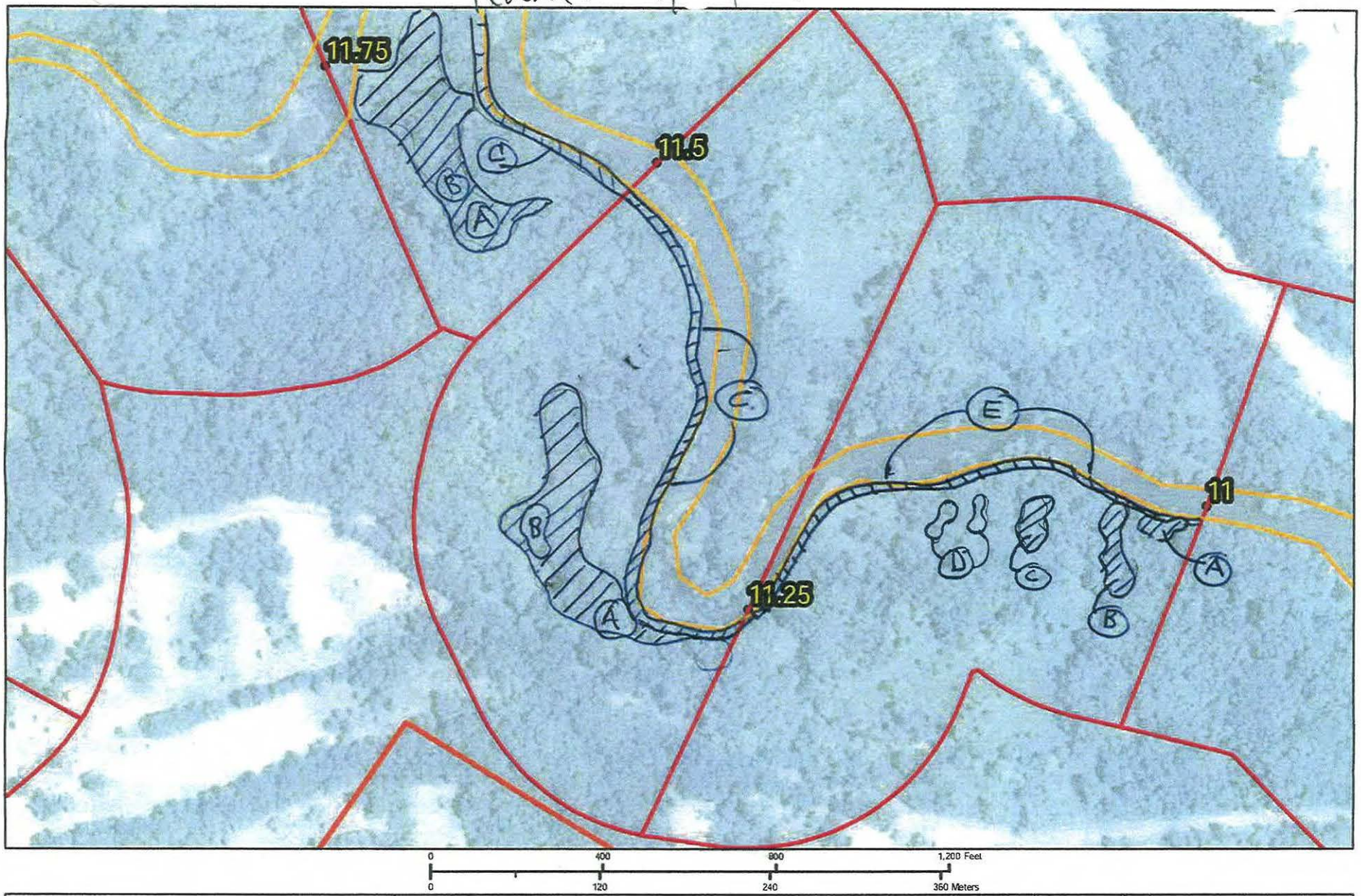
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

team 2 8/7/2010



QuartermileMarkers
Shoreline
River_QuarterMiles
Divisions

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET [illegible] 8

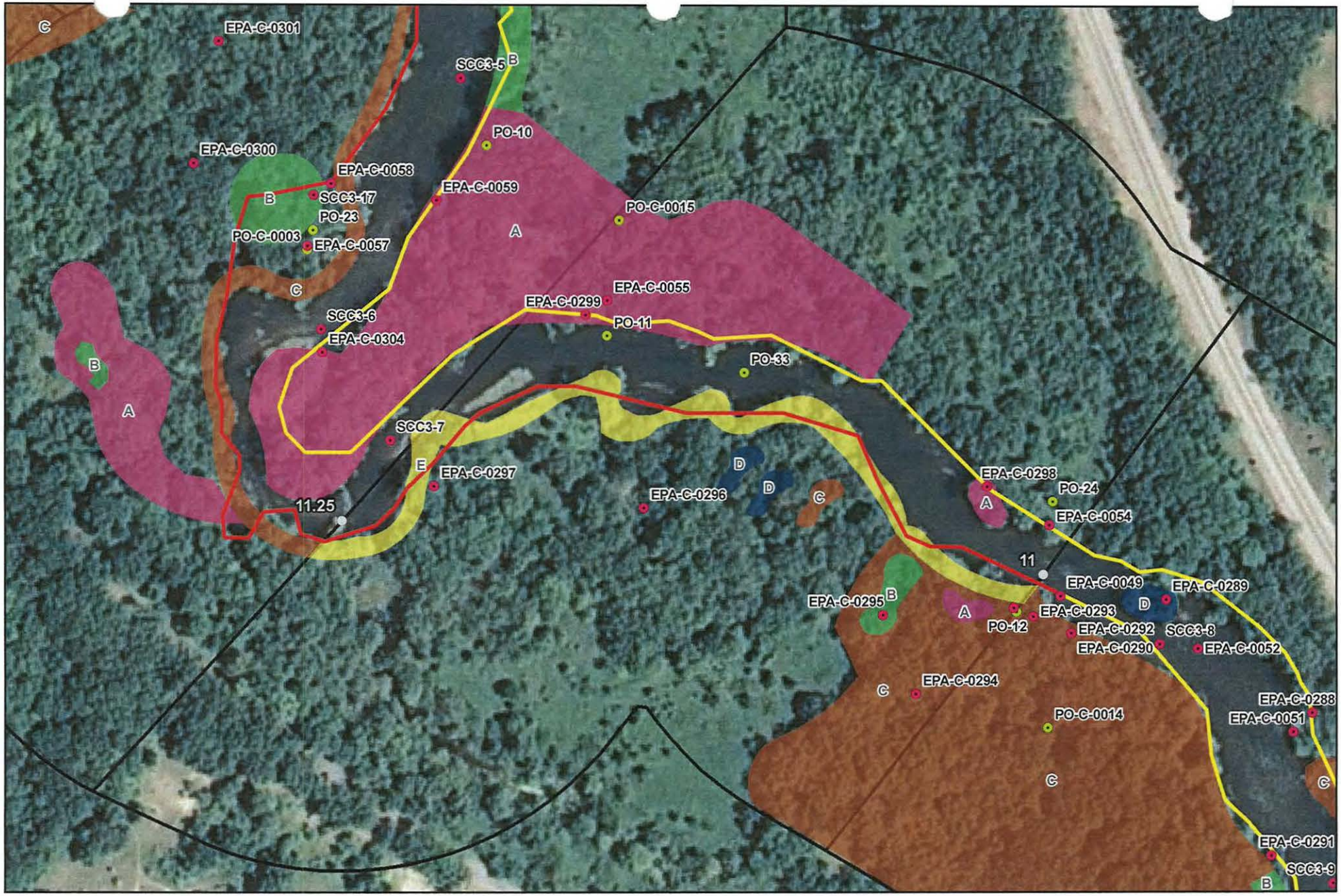
ENTRIX
Down to Earth. Down to Business.

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 11-11.25 Island										
EPA-C-0298	Shoreline	SCAT T3 8/28/10	no reccomendations for clean up at island accross from highly contaminated site					Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	42.30403	-85.13511





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 11-11.25 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

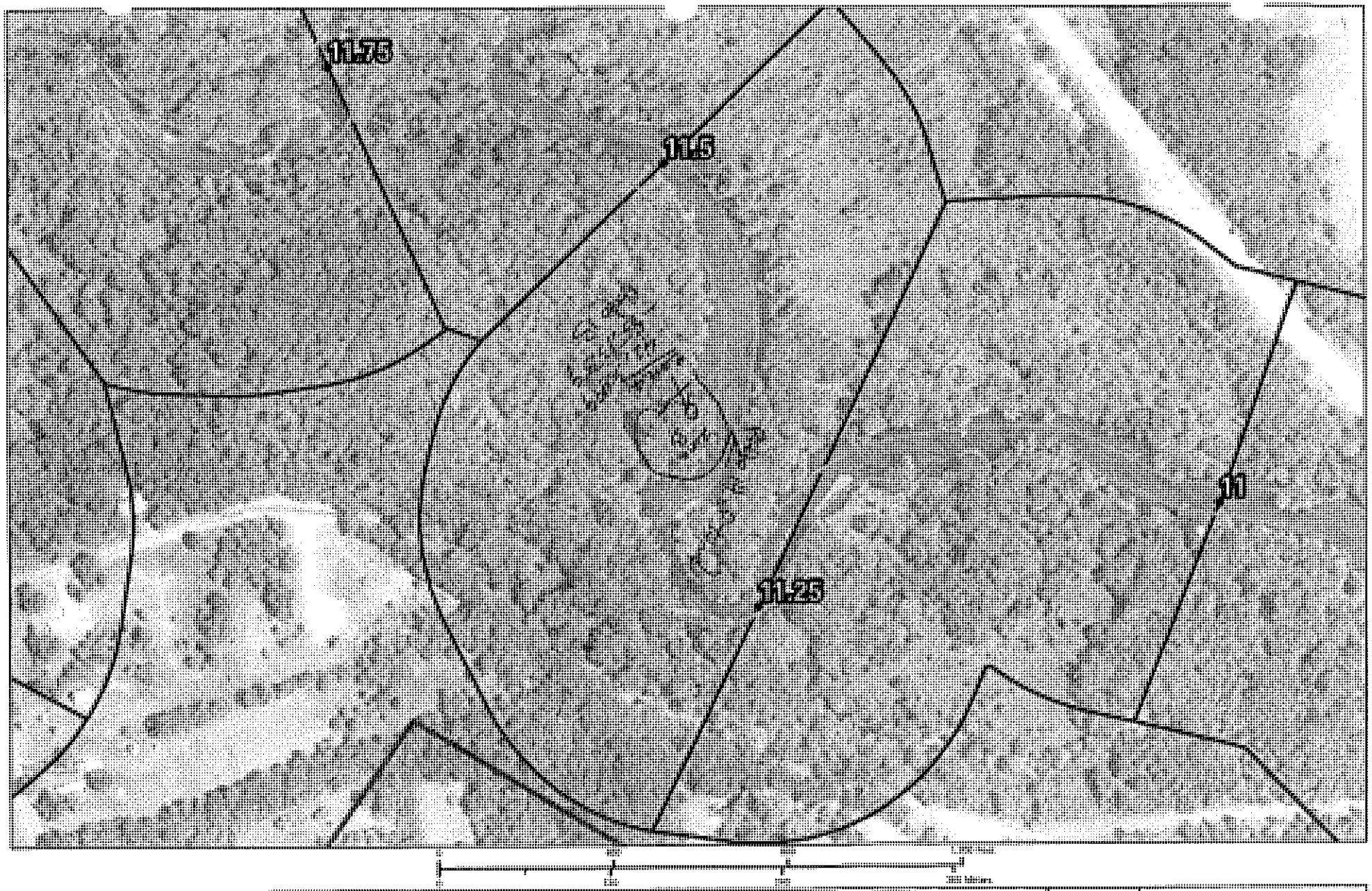
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



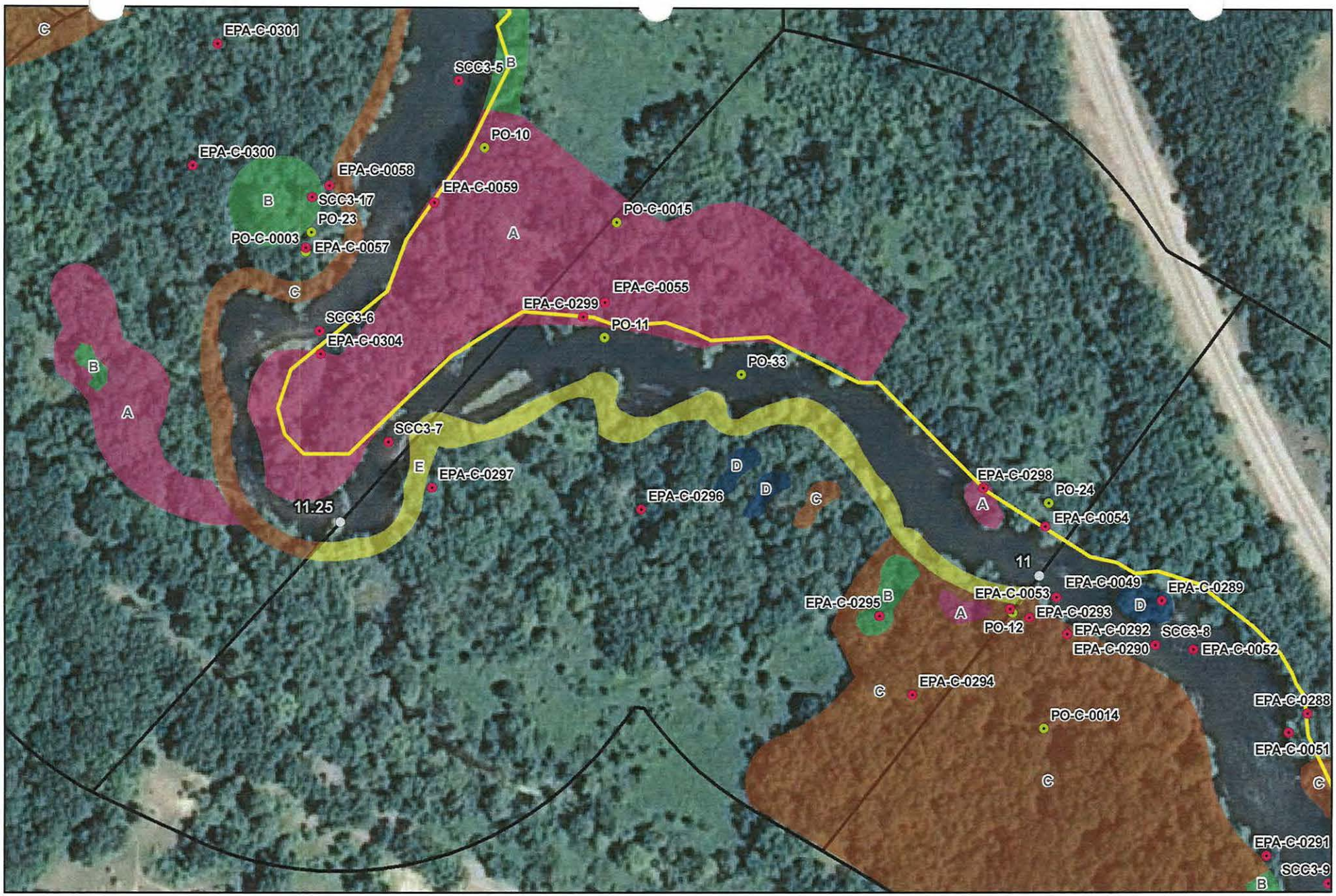
SHORELINE CLEANUP PLAN - SEGMENT SC01
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 11-11.25 Right Bank While Looking Downstream										
EPA-C-0299	Shoreline	SCAT T3 8/27/10	Active work site. Oil removal looks satisfactory and crews are spreading out in different directions. Only sparce staining in the emergent wetland, no action required. Area between 11.0 and Zone A is cleared, no recommendations.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30474	-85.13741
EPA-C-0054	Shoreline	SCAT T1 8/18/10	Surface residue and pooled oil on ground beneath green vegetation.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30387	-85.13475
EPA-C-0055	Shoreline/ Overbank	SCAT T1 8/18/10	Severely impacted area. Oil extends back into marsh opening. Whole marsh is impacted					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30480	-85.13728





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 11-11.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

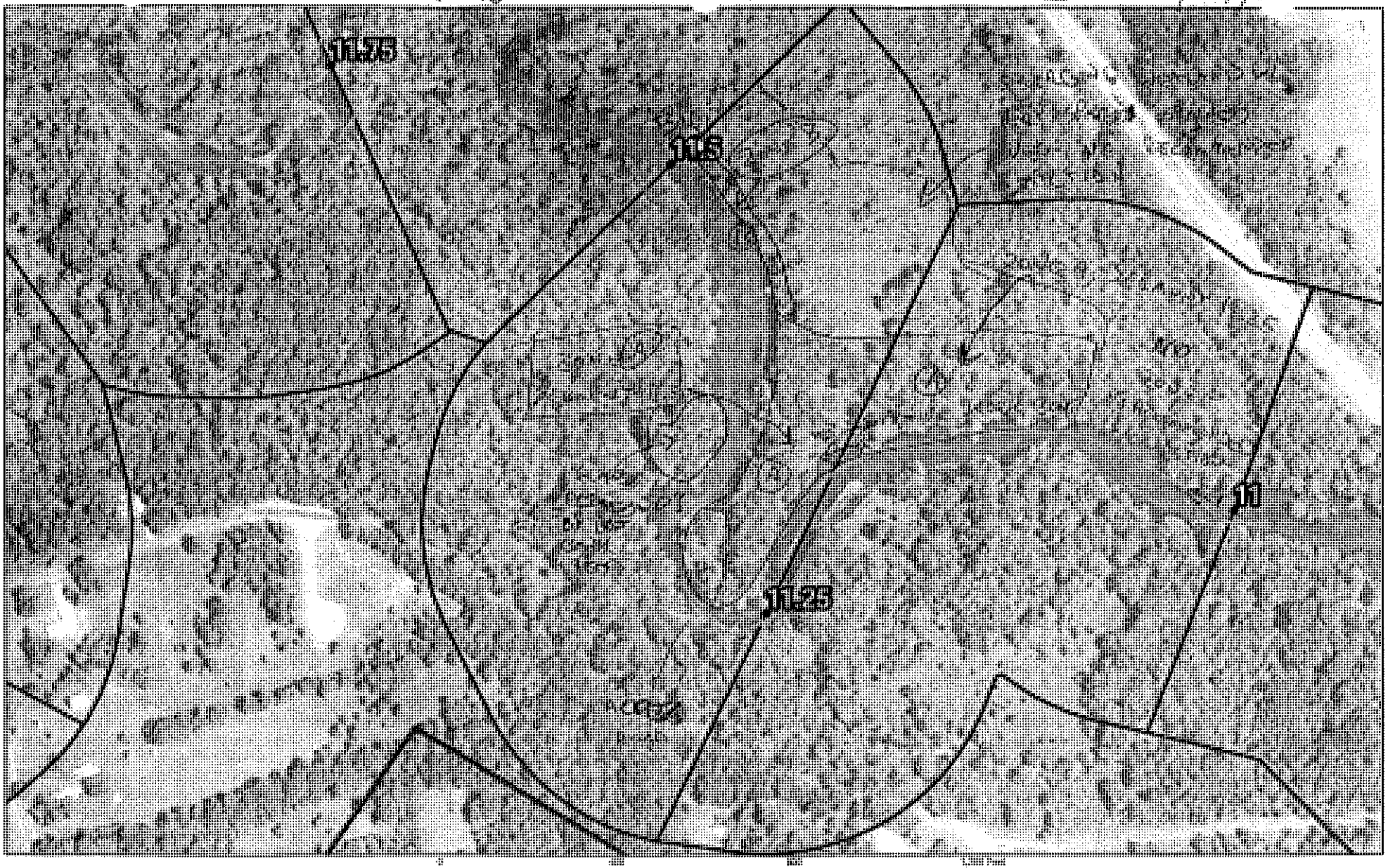
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

M.P 11.25 and 11.50 – RDB SCAT TEAM #3 8/27/19



QuartermileMarkers
Shoreline
River_QuarterMiles
Divisions

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 48

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Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 09-19-10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 11.0 **Start MP to End MP** 11.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island** **Overbank:** LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recommendations

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recommendations

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recommendations

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recommendations

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-19-10 Time: AM / ~~PM~~

Operations Division: C Segment ID: From 11.0 Start MP to End MP 11.75 Segment Length: 0.25 mile

Bank: ~~LDB~~ / ~~RDB~~ ☑ ~~Island~~

Weather: Sun/Cloud/Rain/Snow/ Cloud

Field Inspection Team

~~EPA Inspector:~~

Enbridge Inspector: David Pierce

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 13 areas of concern according to the SCAT report.
Clean up required: Control vegetation, debris removal, pooled oil, flushing, Vegetation removal,

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 13 areas of concern according to the SCAT report.
Clean up is complete according to the recommendation methods

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Releas[illegible]cident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 11-11.25 Left Bank While Looking Downstream											
EPA-C-0294	Shoreline	SCAT T2 8/28/10	GPS @ beginning of zone B. photo 497 shows pooled oil; photo 498 shows oiled branches/debris. isolated coat (stained shoreline and over bank throughout but very small isolated patches-not zoned not continuous)					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30315	-85.13551	Y / N
EPA-C-0295	Shoreline	SCAT T2 8/28/10	isolated coat (stained shoreline and over bank throughout but very small isolated patches-not zoned not continuous)					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30348	-85.13570	Y / N
EPA-C-0296	Shoreline	SCAT T2 8/28/10	GPs at middleof zone two separate pocket5 2nd 70ftW of GPS. isolated coat (stained shoreline and over bank throughout but very small isolated patches-not zoned not continuous)					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30393	-85.13707	Y / N
EPA-C-0297	Shoreline	SCAT T2 8/28/10	GPs @ end of zone. Linear zone along shoreline oil stained veg throughout. photo 499 shows oiled debris. isolated coat (stained shoreline and over bank throughout but very small isolated patches-not zoned not continuous)					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30401	-85.13826	Y / N
EPA-C-0053	Main Channel	SCAT T1 8/14/10	WP71 - pool (inland) 70 x 30 ft. - free unweathered oil, EXTREME!					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30352	-85.13495	Y / N

Printed Team Member Names: ERNIE S., ROSS D., GLENN VW / MIKE ZAMBETIS (ENBRIDGE), HOWARD PHAM (EPA) Kathleen Fairchild (DNR)

Date: 9/20/10 / 9/22/10

Comments:

EPA-C-094 → MONITORING OF ENTIRE FLOODPLAIN RECOMMENDED

EPA-C-095 → DEPRESSIONS OBSERVED APPEARED TO HAVE BEEN SCRAPED. NO VISIBLE OILING WAS NOTICED.

EPA-C-096 → TEAM PERFORMED REMOVAL OF SMALL PATCHES OF OILED VEGETATION. NO NEED TO CALL HOT SHOT CREW.

EPA-C-0297 - SIGNS OF OILED VEGETATION. NO NEED TO DO ANY REMOVAL

EPA-C-053 → OILED VEGETATION APPEARS TO HAVE BEEN REMOVED. ~~WILL BE ADDRESSED AS PART MONITORING WORK~~ SOME SORBENT DAMS WERE PLACED IN CERTAIN AREAS

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 11-11.25 island											
EPA-C-0298	Shoreline	SCAT T3 8/28/10	no reccomendations for clean up at island accross from highly contaminated site					Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	42.30403	-85.13511	(Y) / N

Printed Team Member Names:
Date:
Comments:

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 11-11.25 Right Bank While Looking Downstream											
EPA-C-0299	Shoreline	SCAT T3 8/27/10	Active work site. Oil removal looks satisfactory and crews are spreading out in different directions. Only sparce staining in the emergent wetland, no action required. Area between 11.0 and Zone A is cleared, no recommendations.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30474	-85.13741	(Y) N
EPA-C-0054	Shoreline	SCAT T1 8/18/10	Surface residue and pooled oil on ground beneath green vegetation.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30387	-85.13475	(Y) / N
EPA-C-0055	Shoreline/ Overbank	SCAT T1 8/18/10	Severely impacted area. Oil extends back into marsh opening. Whole marsh is impacted					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30480	-85.13728	Y (N)

Printed Team Member Names: MIKE ZANDSTRA (ENBRIDGE), HOWARD PITAM (USEPA), Kathleen Fairchild (DNRE)
Date: 9/22/10
Comments:

NOTE: (1) SCAT RECOMMENDATIONS FOR THIS SEGMENT WERE ACCOMPLISHED WITH THE EXCEPTION OF THOSE FOR EPA-C-0055 WHICH WAS THE AREA WHERE MANUAL EXCAVATION occurred UNDER A VARIANCE TO RECOMMENDED SCAT PROCEDURES.

(2) EPA-C-0054 HAS BEEN LISTED AS AN O&M PRIORITY LOCATION THAT SHOULD BE MADE A PRIORITY THROUGHOUT THAT PROCESS,

PO-0011 (8/16) Pooled oil, remove pooled oil 42.305 -85.137 (Y) / N
PO-0015 (8/18) Pooled oil, remove pooled oil 42.305 -85.137 (Y) / N
PO-0024 (8/18) Pooled oil, remove pooled oil 42.304 -85.135 (Y) / N
PO-0033 Pooled oil, remove pooled oil 42.304 -85.136 (Y) / N

Verify site on map, per floodplain data.
42.30402
-85.13510
This area may be heavily oiled (>15% oiled)

Addendum to re-SCAT Assessment of Segment 11.25

Feature EPA-C-0055 on the RDB: This feature was not cleared (circled as yes) by the SCAT re-assessment team because mechanical excavation was used to remove the pooled oil and saturated soils which was not a recommended method at the time of the initial SCAT assessment. The use of mechanical excavation was approved by the EPA and Enbridge and accomplished in accordance with a site specific remediation plan.

9/23/10
Joe McGaver, Enbridge Energy

Debora Snell 9/23/10
Debora Snell, MDNRE

Ann Whelan, USEPA

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From** 11 00 **Start MP to End MP** 11 25 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Nat Burbon 9-20-10 Enbridge
Signature MATT BORDSON (date)

[signature] 9/20/10 EPA
Signature (date)

4. **SCAT Reassessment**

[signature] 9/22/10 Enbridge
Signature (date)

Howard Pham 9/22/10 EPA
Signature HOWARD PHAM (date)

[signature] 9/22/10 MDNRE
Signature (date)

5. **EPA**

[signature] 9/25/10 EPA Division Supervisor
Signature (date)
Jordan Garrard

OTM required near PO-C-0015 (Tree Bag) area

Appendix E
Photographs

Field Photo Log – Segment 11.25



Photo 0783 – Facing northwest at right descending overbank near EPA-C-0054.



Photo 0785 – Facing southeast at island near EPA-C-0298.

Field Photo Log – Segment 11.25



Photo 0787 – Facing northwest at right descending bank.



Photo 0798 – Facing northeast at right descending overbank near EPA-C-0055.

Field Photo Log – Segment 11.25



Photo 0799 – Facing west at right descending bank near EPA-C-0055.



Photo 0857 – Facing northeast at left descending bank near EPA-C-0297.

Field Photo Log – Segment 11.25



Photo 0860 – Facing southwest at left descending overbank near EPA-C-0296.



Photo 0861 – Facing east at left descending bank near in zone C.

Field Photo Log – Segment 11.25



Photo 0865 – Facing east at left descending overbank near EPA-C-0295.



Photo 0867 – Facing south at left descending overbank near EPA-C-0053.

Field Photo Log – Segment 11.25



Photo 0869 – Facing north at left descending overbank near EPA-C-0294.



Photo 0871 – Facing southeast at left descending bank near SCC3-8.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 11.5 – MP 11.25-11.5

Enbridge Energy

September 24, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 11.5 had a heavy level of oil staining and patchy tar covered vegetation and debris on the left descending bank. Pooled oil was observed throughout the shore and overbank; furthermore, the floodplain of the left descending bank was heavily inundated with areas of pooled oil, one being 100 meters by 30 meters in size. Pooled oil was also found on the shoreline and overbank of both islands in this segment. The overbank areas on the right descending bank contained evidence of river deposition during flood stages, with saturated soil throughout the peninsula. Sparse staining of vegetation in the emergent wetland inland of the peninsula also resulted.

Actions

Clean up methods required for the pooled oil (100m X 30m) previously referred to was outside the recommended methods at the time of the initial SCAT assessment. The use of mechanical excavation was approved by the EPA and Enbridge and accomplished in accordance with a site specific remediation plan. The shoreline clean-up activities within Segment 11.5 consisted of the following:

- Mechanical removal of oil saturated soil (air operations);
- Cut and bag low hanging limbs extending over and into the water 2" above oiling level;
- Vegetation removal, leaving roots intact and woody plants greater than 2" in diameter;
- Manual removal of oiled soil;
- Removal of oiled debris;
- Removal of pooled oil through low pressure/high volume flushing and absorption methods.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Stained soil along the left and right descending banks;
- Small pools of oil on the island just off the peninsula's shoreline remain and are to be monitored during Operations and Maintenance;
- An area saturated in oil, extending from mile marker 11.25 out to 11.5 on the right descending bank, remains and is to be monitored during Operations and Maintenance.
- Oiled herbaceous vegetation on the left descending shoreline and overbank in beginning of segment;

- Oiled herbaceous vegetation and oiled woody vegetation on the left descending bank midway through segment;
- Oiled woody vegetation and oil herbaceous vegetation on left descending bank near Segment 11.75;
- Oiled soil and oiled woody vegetation on island midway through segment;
- Oiled woody vegetation and oiled debris on right descending shoreline and overbank on peninsula in beginning of segment;
- Oiled soil and oiled woody vegetation on right descending shoreline and overbank midway through segment;
- Oiled woody vegetation and right descending bank near Segment 11.75.

Segment 11.5 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Figure 6.
Shoreline oil terminology/codes for spills of light, refined oil.

Surface Oil Distribution (on sediments and nearshore water)

C	Continuous	91 - 100% cover
B	Broken	51 - 90%
P	Patchy	11 - 50%
S	Sporadic	1 - 10%
T	Trace	<1%

Surface and subsurface Oiling Descriptors - THickness

SM	Smell	No visible oil; detectable only by smell
FL	Film	Feels greasy when sediments are rubbed
SH	Sheen	Visible sheen on water surfaces
CT	Coat	Visible coating of oil
PO	Pooled	Liquid oil accumulated on surface

Surface Oiling Descriptors - Color

None	Brown
Shiny	Yellow
Rainbow	Red

Surface Oiling Descriptors - Width

N	Narrow	< 1 m
M	Medium	> 1 to <3 m
W	Wide	> 3 m; estimate width if possible

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 m)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2-4 mm)		

Sheen on Water Descriptors

	Approx. Layer-Thickness mm	inches	Approx. Volume per Area liters/km^2	gallons/nm^2
barely visible	0.00004	0.000002	50	40
silver sheen	0.00007	0.000003	100	75
first color trace	0.0001	0.000004	200	150
bright colors	0.0003	0.00001	400	300
dull colors	0.001	0.00004	1200	1000
dark colors	0.003	0.0001	3600	3000

Surface Oiling Descriptors - Width (modify for spill-specific conditions)

Very Narrow	< ____m
Narrow	>____-<____m
Medium	>____-<____m
Wide	< ____m

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

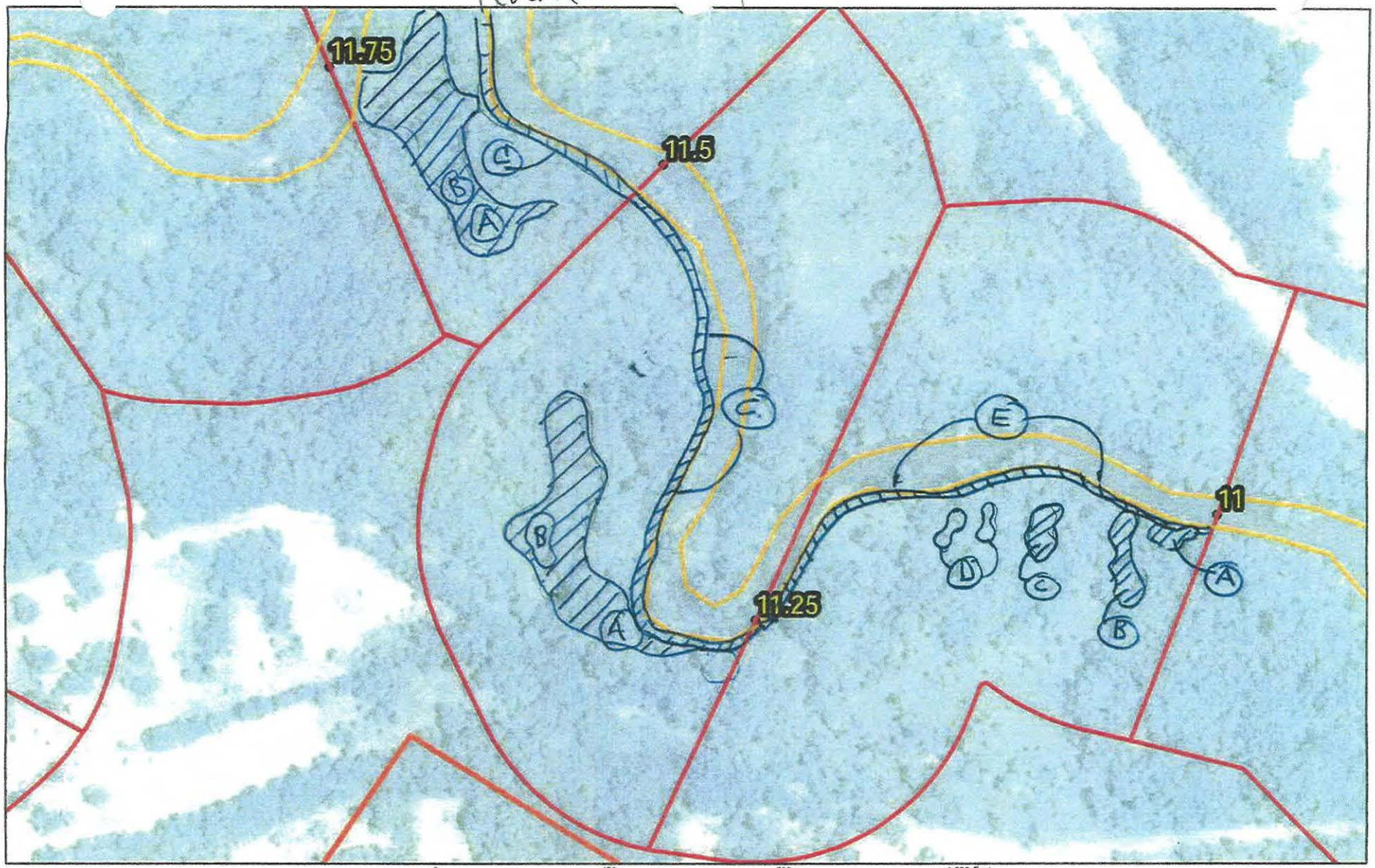
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 11.25-11.5 Left Bank While Looking Downstream										
EPA-C-0300	Shoreline	SCAT T2 8/28/10	GPs @ upstream shoreline corner 20 X 20._ patches throughout. photo 523 is looking downstream from milepost 11.25; photo 500 shows pooled oil in zone A; photo 501 is example of patchy covered veg/debris in zone A. Boat ramp under construction					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30536	-85.13965
EPA-C-0301	Shoreline	SCAT T2 8/28/10	zone w/i A pooledoil. Boat ramp under construction					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30588	-85.13952
EPA-C-0302	Shoreline	SCAT T2 8/28/10	Pooledoil along woody debris; photo 504. Boat ramp under construction					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30646	-85.13878
SCC3-5	Shoreline	Shoreline Assessment	●	●	●		Small eddy with recoverable oil. Floodplain heavily oiled.		42.30573	-85.13813
SCC3-6	Shoreline	Shoreline Assessment			●	●			42.30467	-85.13892
SCC3-7	Shoreline	Shoreline Assessment	●		●	●	Small island. Floodplain is heavily oiled.		42.30420	-85.13852
EPA-C-0058	Shoreline/ Overbank	SCAT T1 8/17/10	Pooled oil (100m x 30m) off shoreline. Floodplain almost totally inundated.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30528	-85.13887

team 2 8/17/2010



QuartermileMarkers
Shoreline
River_QuarterMiles
Divisions

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

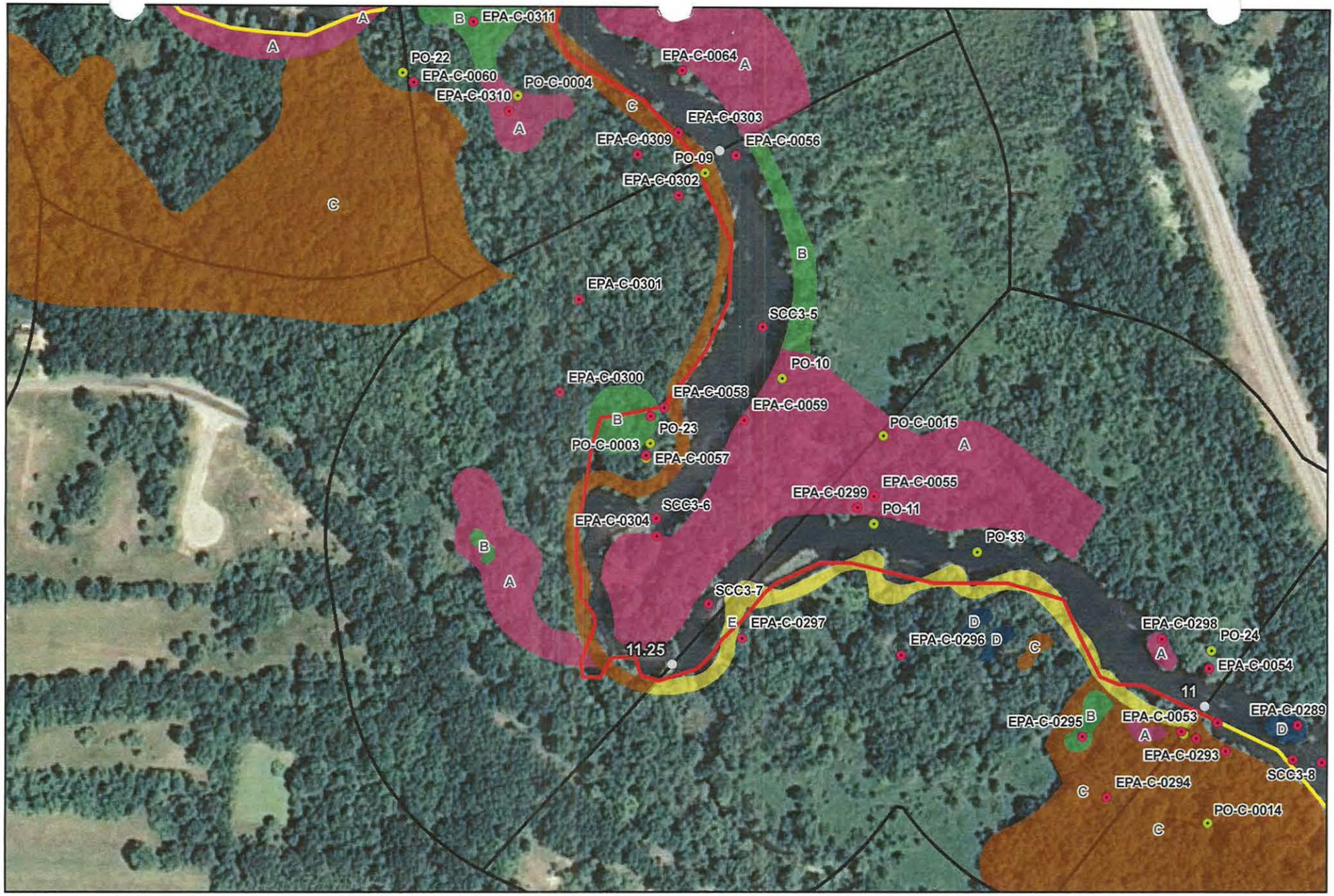
Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 18

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 11.25-11.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEAN... RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 11.25-11.5 Island										
EPA-C-0057	Shoreline/ Overbank	SCAT T1 8/17/10	Pooled oil on the island interior					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30502	-85.13900



QuarterMileMarkers
Shoreline
River_QuarterMiles
Division

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 48

ENTRIX
Down to Earth, Down to Business

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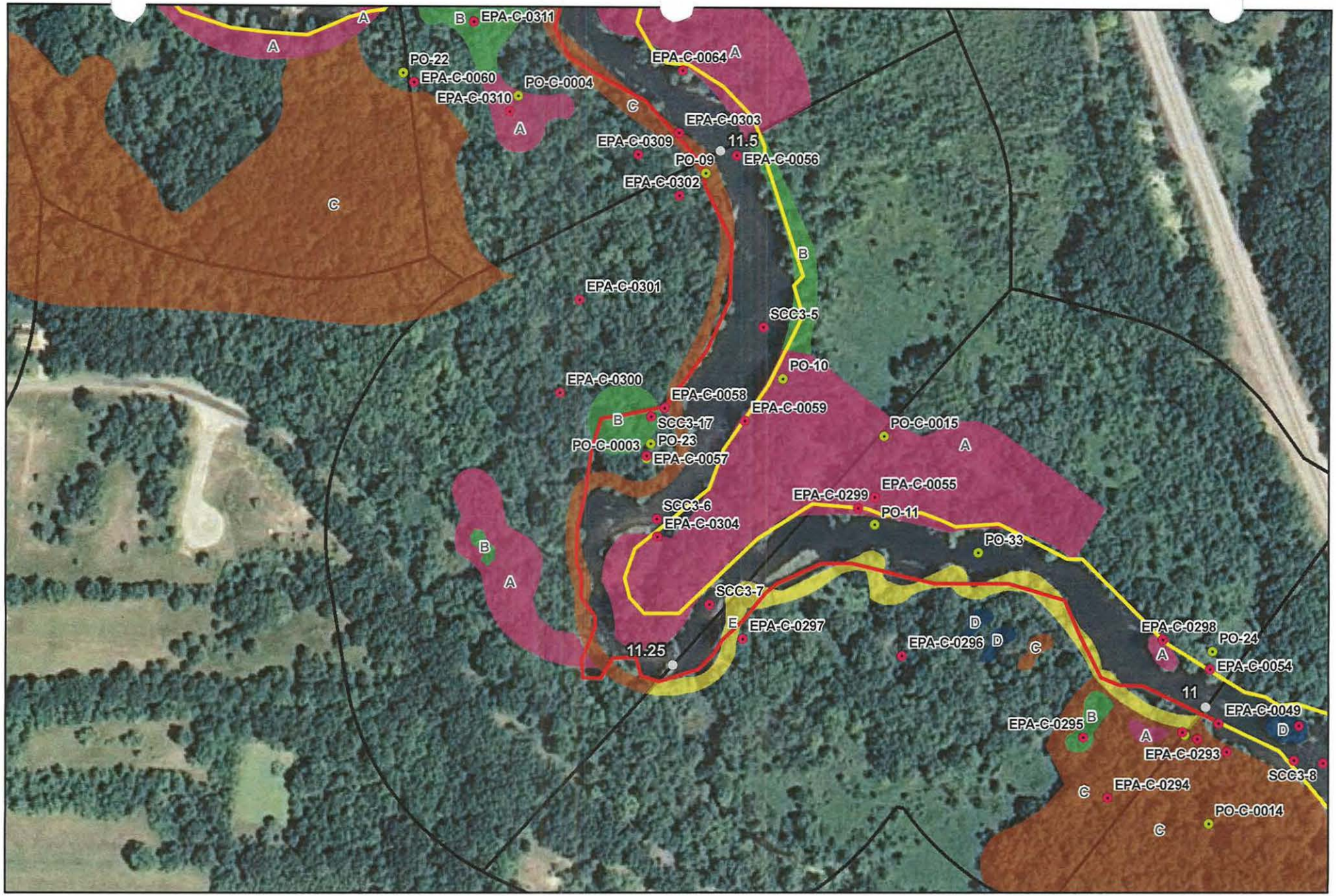
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

Division C: Mile Marker 11.25-11.5 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

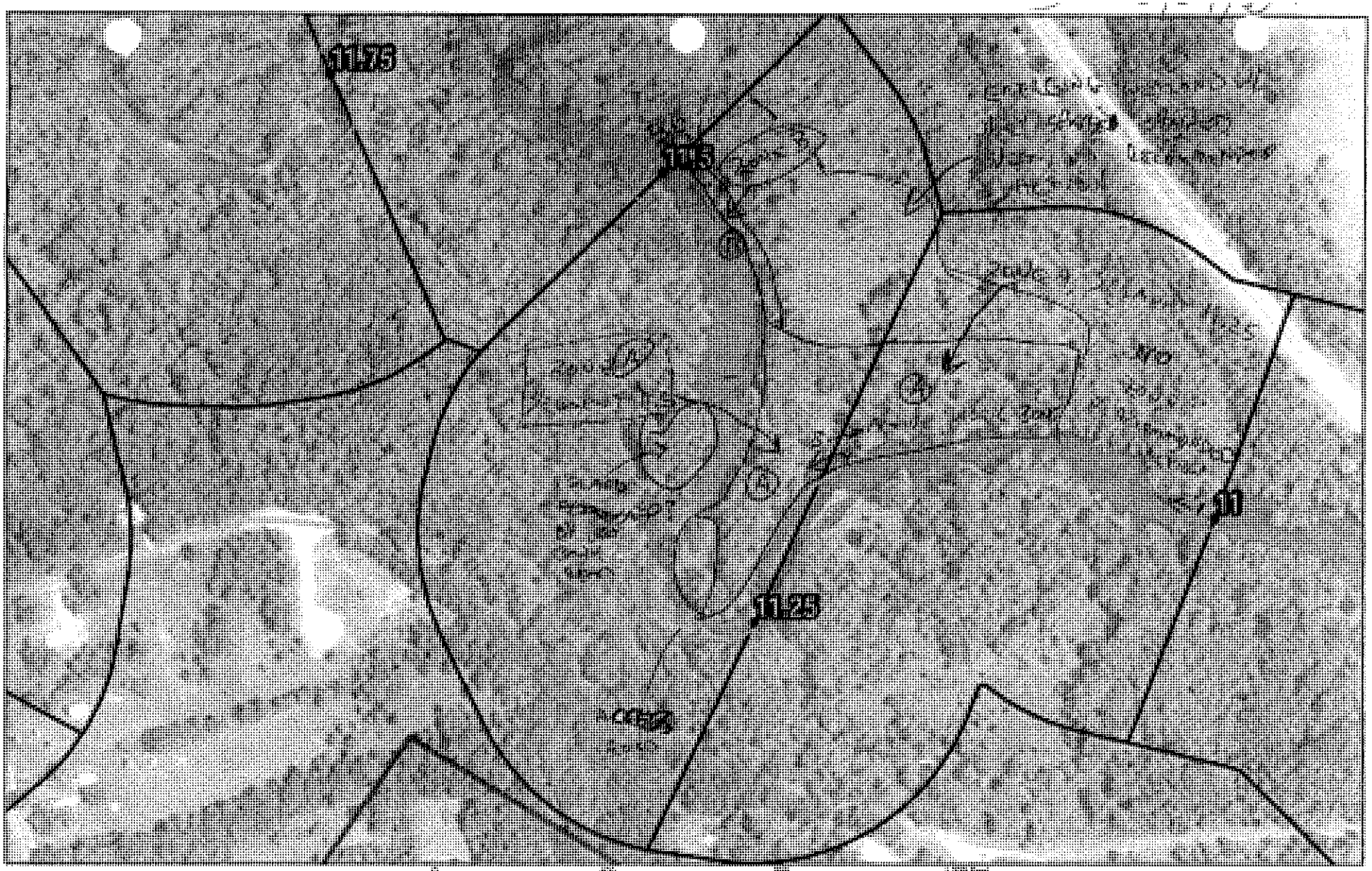
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 11.25-11.5 Right Bank While Looking Downstream										
EPA-C-0304	Shoreline	SCAT T3 8/27/10	Zone A is a peninsula. This zone also includes an island. Island has several small patches of pooled oil. Only sparce staining in the emergent wetland, no action required.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30457	-85.13891
SCC3-17	Shoreline	Shoreline Assessment	●			●	High volume flush.		42.30523	-85.13897
EPA-C-0059	Shoreline/ Overbank	SCAT T1 8/18/10	Evident river deposition of oil during flood stages					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30522	-85.13827



Quarter-mileMarkers
Shoreline
River_QuarterMiles
Division

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

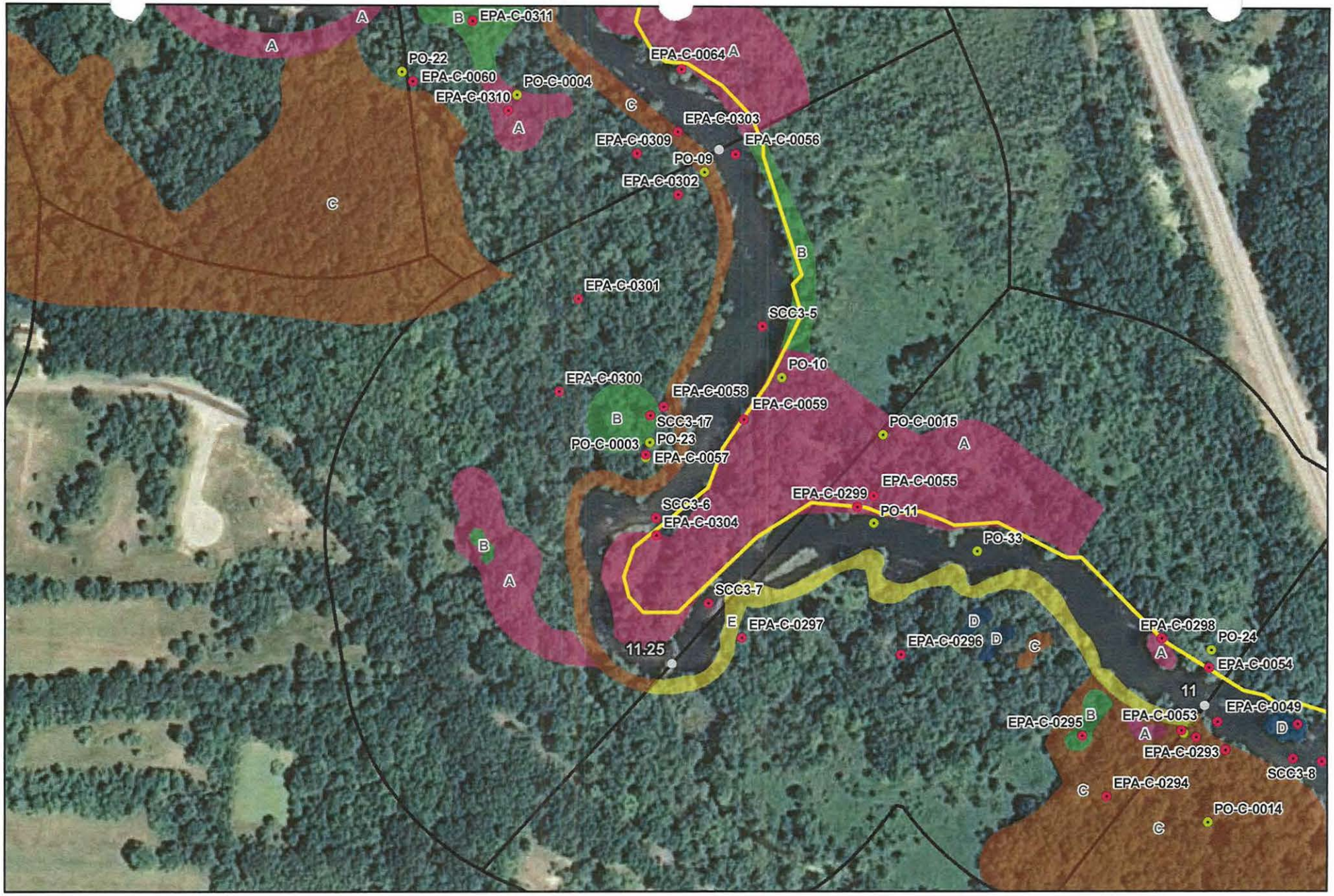
Image: 2009 NAIP

SHEET 1 of 8

ENTRIX
Down to Earth Down to Business

www.entrix.com

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 (Feet)





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 11.25-11.5 Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 09-20-10 Time: AM / PM

Operations Division: C Segment ID: From 11.25 Start MP to End MP 11.5 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature] PHILIP GARDNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recomendations

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recomendations

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recomendations

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recomendations

Revised9/01/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-20-10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 11.25 **Start MP to End MP** 11.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

~~**EPA Inspector:**~~

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature] PHILIP GARDNER

SCAT Reviewed – Description of Clean Up Required

Reviewed 12 areas according to the SCAT report. Clean up required Flushing, Vegetation removed, limbs removed, debris removed, and Pooling.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 12 areas according to the SCAT report. Cleanup is complete according to the recommendation methods.

Punchlist Items Identified

☑ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 11.25-11.5 Left Bank While Looking Downstream											
EPA-C-0300	Shoreline	SCAT T2 8/28/10	GPs @ upstream shoreline corner 20 X 20._ patches throughout. photo 523 is looking downstream from milepost 11.25; photo 500 shows pooled oil in zone A; photo 501 is example of patchy covered veg/debris in zone A. Boat ramp under construction					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30536	-85.13965	(Y) / N
EPA-C-0301	Shoreline	SCAT T2 8/28/10	zone w/i A pooledoil. Boat ramp under construction					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30588	-85.13952	(Y) N
EPA-C-0302	Shoreline	SCAT T2 8/28/10	Pooledoil along woody debris; photo 504. Boat ramp under construction					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30646	-85.13878	(Y) / N
SCC3-5	Shoreline	Shoreline Assessment	●	●	●		Small eddy with recoverable oil. Floodplain heavily oiled.		42.30573	-85.13813	(Y) / N
SCC3-6	Shoreline	Shoreline Assessment			●	●			42.30467	-85.13892	(Y) / N
SCC3-7	Shoreline	Shoreline Assessment	●		●	●	Small island. Floodplain is heavily oiled.		42.30420	-85.13852	(Y) / N
EPA-C-0058	Shoreline/ Overbank	SCAT T1 8/17/10	Pooled oil (100m x 30m) off shoreline. Floodplain almost totally inundated.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30528	-85.13887	Y (N)

Printed Team Member Names: ERNIE CARKNAD, DNRE; MIKE ZAMBETIS (ENBRIDGE), HOWARD PHAM, USEPA

Date:

Comments:

NOTE: EPA-C-0058 REFERS TO A PORTION OF A VERY LARGE AREA (TOTAL AREA UNDETERMINED) (ALSO EXTENDING INTO SEGMENT 11.75) THAT WAS IDENTIFIED BY US FISH & WILDLIFE (JOE HAAS) AS HAVING A UNIQUE & DIVERSE EMERGENT WETLAND HABITAT. PER FIELD MEETING WITH ANN [illegible] & JOE MCGALER ON THIS DATE, THE ABOVE AREA IS BEING CONSIDERED AS OUTSIDE THE NORMAL SCAT PROCESS. SEE O&M SHEET FOR FURTHER INFO. OUTSIDE THIS AREA, THE SCAT RECOMMENDATIONS HAVE BEEN MET.

PO-0003 (8/18) Pooled oil, remove pooled oil 42.305 -85.139 (Y)/ N
PO-0009 (8/16) Large pooled oil, remove pooled oil 42.301 -85.139 (Y)/ N
PO-0023 (8/18) Pooled oil, remove pooled oil 42.305 -85.139 (Y)/ N

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 11.25-11.5 Island											
EPA-C-0057	Shoreline/ Overbank	SCAT T1 8/17/10	Pooled oil on the island interior					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30502	-85.13900	(Y) / N

Printed Team Member Names: HOWARD PITAM, USEPA
MIKE ZANDSTRA, ENBRIDGE
ERNIE SARKIPATO, DNRE

Date: 9/21/10

Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 11.25-11.5 Right Bank While Looking Downstream											
EPA-C-0304	Shoreline	SCAT T3 8/27/10	Zone A is a peninsula. This zone also includes an island. Island has several small patches of pooled oil. Only sparce staining in the emergent wetland, no action required.					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30457	-85.13891	(Y) / N
SCC3-17	Shoreline	Shoreline Assessment	●			●	High volume flush.		42.30523	-85.13897	(Y) N
EPA-C-0059	Shoreline/ Overbank	SCAT T1 8/18/10	Evident river deposition of oil during flood stages					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30522	-85.13827	Y (N)

Printed Team Member Names: MIKE ZAMBETIS (ENBRIDGE), HOWARD PEARN, USEPA, ERNIE SARLI BATO, DNRE

Date: 9/21/10

Comments:

NOTE: EPA-C-0059 IS THE AREA WITHIN THE VARIANCE TO THE SCAT PROCESS WAS OBTAINED AND +/- 1 ACRE OF MANUAL EXCAVATION OCCURRED. CONSEQUENTLY THIS AREA HAS BEEN CONSIDERED AS BEING OUTSIDE THE NORMAL SCAT PROCESS AND NOT GRANTED THE APPROVALS GIVEN TO OTHER SCAT RECOMMENDATIONS FOR THE SEGMENT.

EPA-C-0056 SCAT T1 (8/14) No comment, please refer to Kalamazoo Enbridge Oil Cleanup Methods 42.307 -85.138

Y (N)

PO-0010 (8/16) Pooled oil, remove pooled oil 42.305 -85.138

Addendum to re-SCAT Assessment of Segment 11.50

Feature EPA-C-0059 on the RDB: This feature was not cleared (circled as yes) by the SCAT re-assessment team because mechanical excavation was used to remove the pooled oil and saturated soils which was not a recommended method at the time of the initial SCAT assessment. The use of mechanical excavation was approved by the EPA and Enbridge and accomplished in accordance with a site specific remediation plan.

9/23/10
Joe McGaver, Enbridge Energy

Debora Snell 9/23/10
Debora Snell, MDNRE

Ann Whelan, USEPA

Addendum to re-SCAT Assessment of Segment 11.50

Feature EPA-C-0058 on the LDB: This feature was not cleared (circled as yes) by the SCAT re-assessment team because the initial SCAT recommendations had not been performed. This area had been identified by the U.S. Fish and Wildlife Service as a diverse sensitive wetland that should be restored by natural attenuation rather than removal of impacted vegetation.

9/23/10
Joe McGaver, Enbridge Energy

Debora Snell 9/23/10
Debora Snell, MDNRE

Ann Whelan, USEPA

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From** 1125 **Start MP to End MP** 1150 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☐

3. **Inspection**

Matt Bordelon 9-20-10 Enbridge
Signature MATT BORDELON (date)

E Kruglinski 9/20/10 EPA
Signature (date)

4. **SCAT Reassessment**

Michael A. Zambetis 9/21/10 Enbridge
Signature MICHAEL A. ZAMBETIS (date)

Howard Pham 9/21/10 EPA
Signature HOWARD PHAM (date)

9/21/10 MDNRE
Signature (date)
ERNEST SARABIA TO

5. **EPA**

9/24/10 EPA Division Supervisor
Signature (date)
Jordan Garrard

O+M near SCAT Point 0304, SNARE boom staked into the ground

Appendix E
Photographs

Field photo log – 11.50



Photo 0791 – Facing southwest at right descending bank near EPA-C-0059



Photo 0793 – Facing southwest on right descending bank

Field photo log – 11.50



Photo 0797 – Facing northeast on right descending overbank near SCC3-7



Photo 0805 – Facing south on island SCC3-6

Field photo log – 11.50



Photo 0807 – Facing northwest right descending bank near SCC3-5



Photo 0809 – Facing north on right descending bank

Field photo log – 11.50

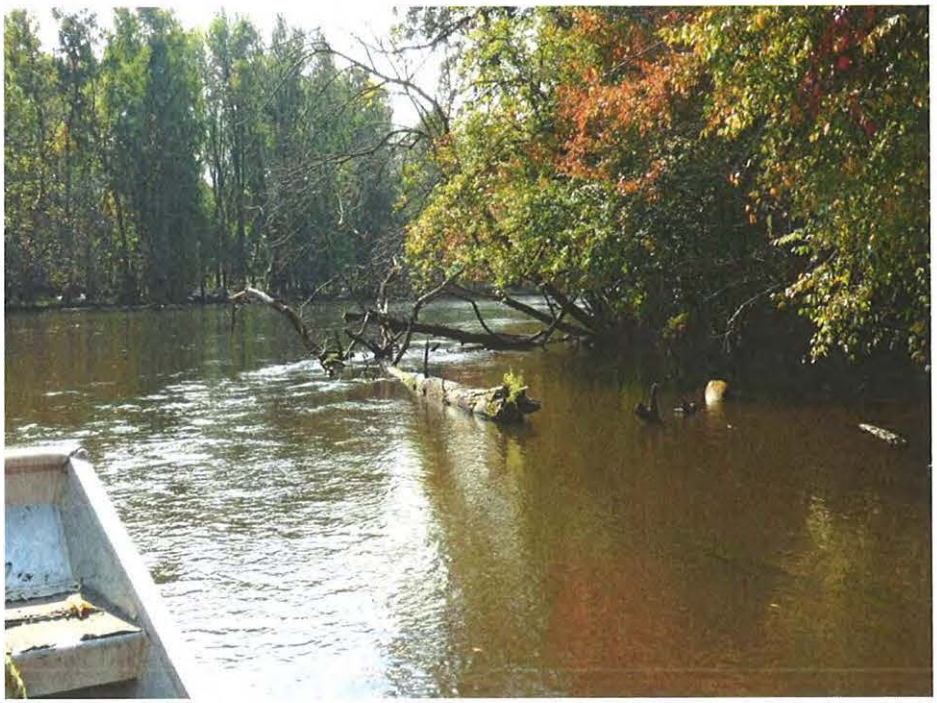


Photo 0845 – Facing southeast at left descending band near EPA-C-0302



Photo 0849 – Facing south at left descending overbank near EPA-C-0300

Field photo log – 11.50



Photo 0855 – Facing south at left descending bank

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 11.75 – MP 11.50 to 11.75

Enbridge Energy

September 24, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The left descending bank of Segment 11.75 had heavy levels of oil staining. The left descending bank also had oiled debris in the upstream portion of the segment and overhanging oiled vegetation along the shoreline. Oiled vegetation and areas pooled oil were found throughout the peninsula located at the left descending overbank. The overbank areas on the left descending bank also contained evidence of river disposition during flood stages, with saturated soil throughout the peninsula. The right descending bank contained patchy oiled debris and vegetation in the downstream portion of the segment. Oil stained vegetation and mousse were found in the beginning of this segment on the right descending bank. In addition, the right descending bank had a heavy film with flecks of oil located in vernal pools located near Segment 12. Stained and coated vegetation, as well as surface residue and film were observed along the right descending bank.

Actions

The shoreline cleanup activities within Segment 11.75 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Vegetation removal from the waterline leaving roots intact and woody plants greater than 2" in diameter;
- Manual oil removal;
- Manual removal of oiled debris;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level.

Outcome

Forested and emergent wetlands with pooled oil and saturated soils were left to naturally attenuate due to a recommendation of avoidance developed by USFWS following original SCAT recommendations. Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- The tip of the peninsula on the left descending bank has oiled soil;
- Oiled woody vegetation and oiled herbaceous vegetation was found on the peninsula of the left descending bank;
- Oiled soils were found on the left descending over bank;
- Oiled debris was found throughout the entire segment on both the left and right descending shorelines;

- Oiled herbaceous vegetation was observed in the upstream section of the right descending bank;
- Oiled debris and oiled woody vegetation was found in the downstream portion of the right descending bank.

Segment 11.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

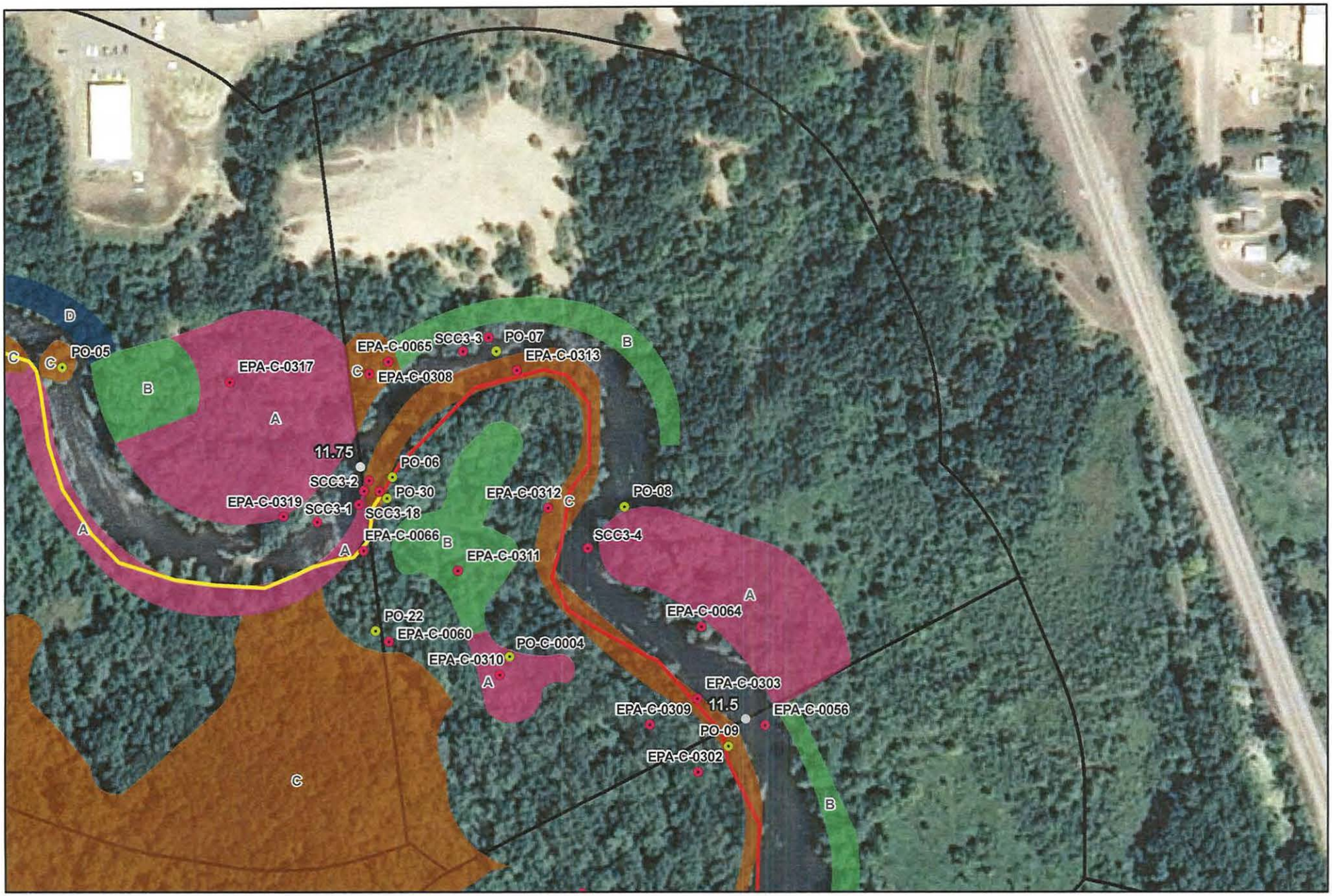
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 11.5-11.75 Left Bank While Looking Downstream										
EPA-C-0303	Shoreline	SCAT T2 8/28/10	oiled snag (woody debris oil stained overhanging veg along shoreline). photo 505 is looking downstream from 11.5 milepost					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30681	-85.13879
EPA-C-0309	Shoreline	SCAT T2 8/28/10	continuation of previous Quarter mile zone; photo 506 is looking downstream from milepost 11.5; photo 507 shows oiled debris in zone A					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30668	-85.13909
EPA-C-0310	Shoreline	SCAT T2 8/28/10	photo 508 shows pooled oil in zone B					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30691	-85.14006
EPA-C-0311	Shoreline	SCAT T2 8/28/10	Throughout zone B numerous ponding follow for. GPs point along oiled path to large amounts of pooledoil; photo 510 shows pooled oil					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30741	-85.14034
EPA-C-0312	Shoreline	SCAT T2 8/28/10	GPs notes beginning of shoreline impact. zone D ends about 100 feet upstream from milepost 11.75. photo 509 shows oiled vegetation					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30771	-85.13976
EPA-C-0313	Shoreline	SCAT T2 8/28/10						Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30836	-85.13997
SCC3-2	Shoreline	Shoreline Assessment					Floodplain needs closer inspection by foot.		42.30778	-85.14095
SCC3-3	Shoreline	Shoreline Assessment	●		●		Overhanging vegetation and steep banks. Small boat ops / airboat, poison ivy on site.		42.30845	-85.14032
SCC3-4	Shoreline	Shoreline Assessment	●		●		Floodplain heavily oiled approx 10m over banks.		42.30752	-85.13950

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 11.5-11.75 Left Bank While Looking Downstream Contd.										
EPA-C-0061	Main Channel	SCAT T2 8/14/10	WP72 - pool oil inlnand. 5 ft from shore. Black.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30852	-85.14015
EPA-C-0062	Main Channel	SCAT T2 8/14/10	WP73 - back pool and free black oil 30 x 50 15:11					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30778	-85.14085





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B BC C D E F G H NO OIL ZONE

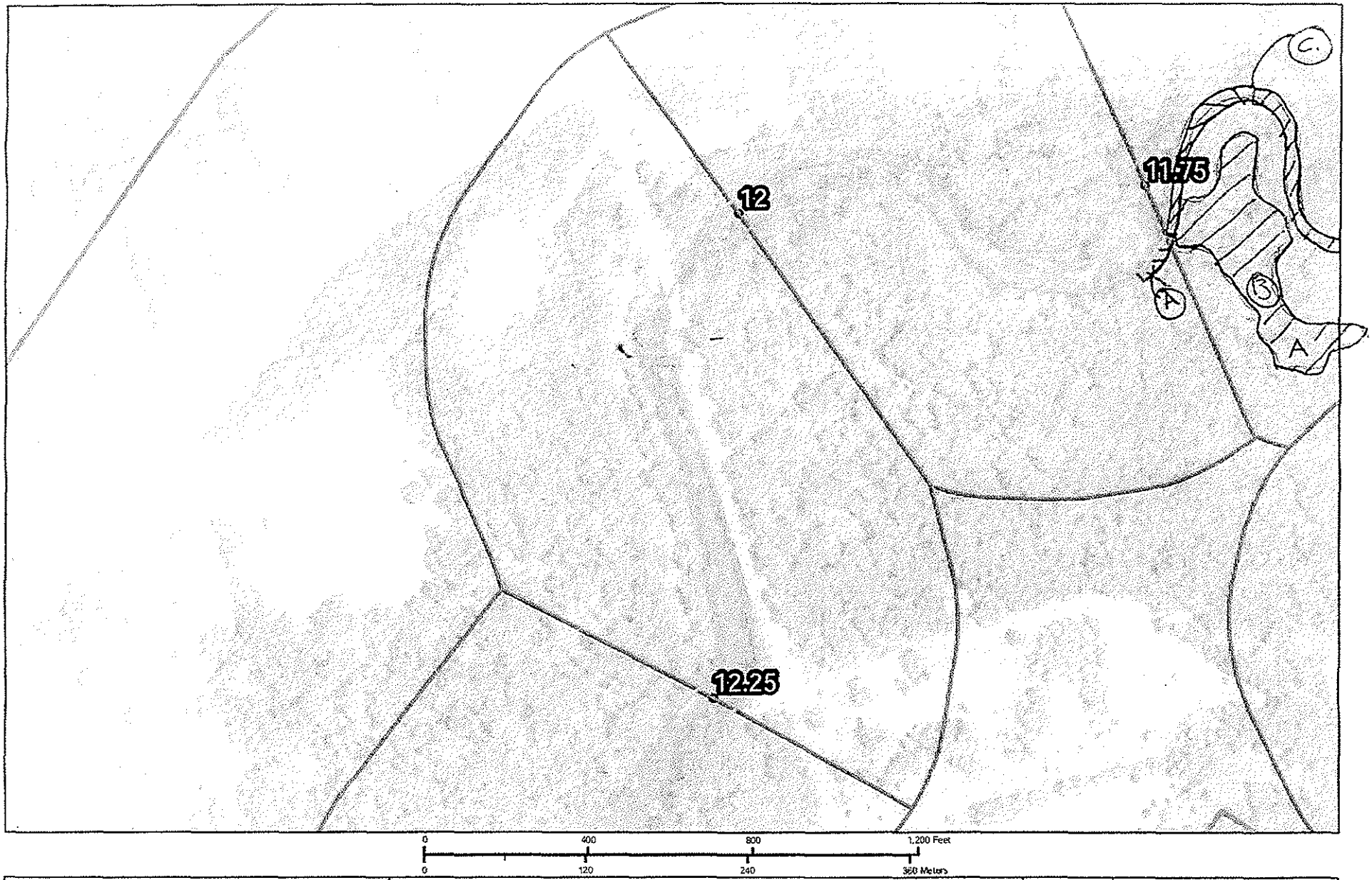
Division C: Mile Marker 11.5-11.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



QuartermileMarkers
Shoreline
River_QuarterMiles
Divisions

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

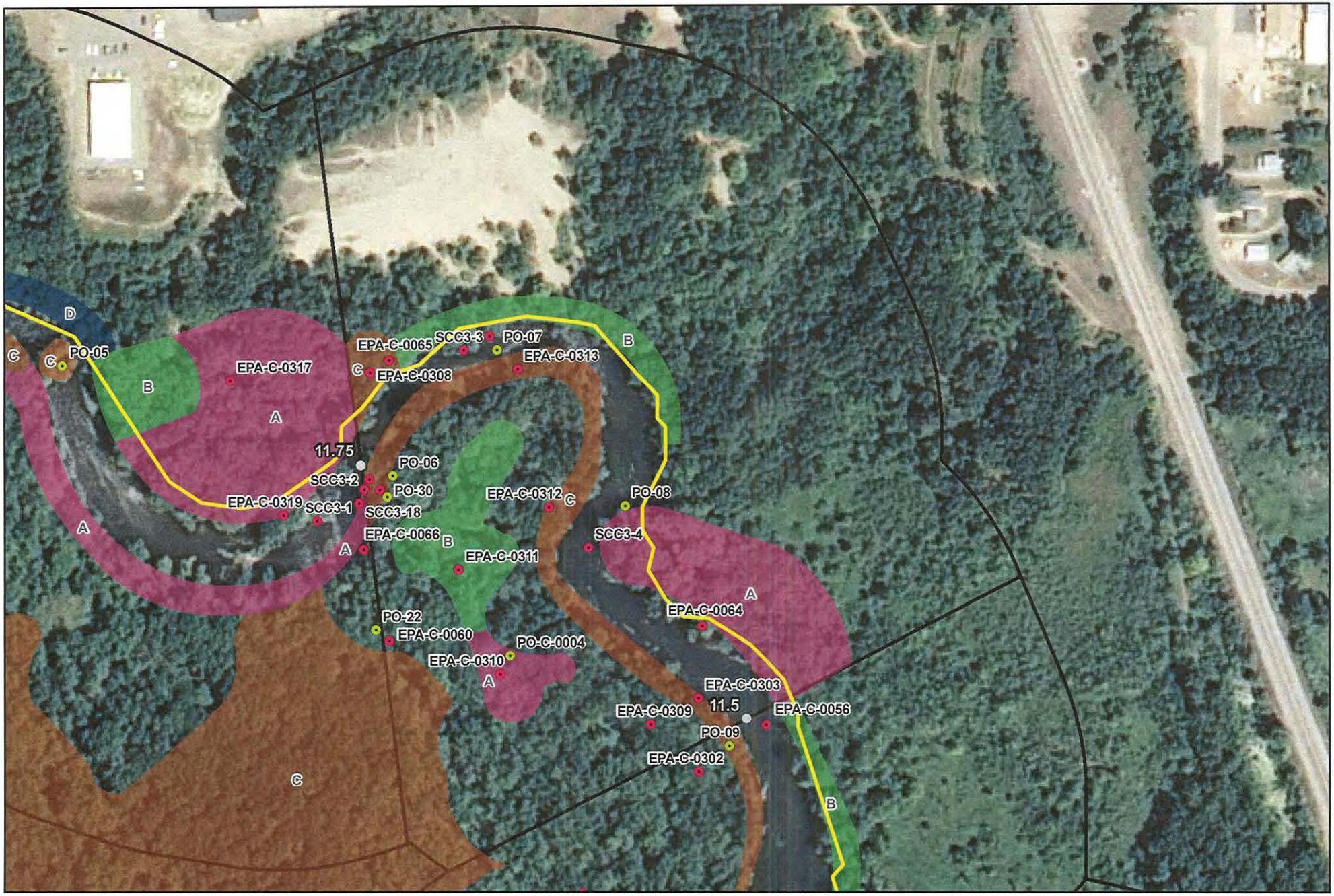
Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET 1 of 12

ENTRIX
Down to Earth Down to Business
www.entrix.com

OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 11.5-11.75 Right Bank While Looking Downstream										
EPA-C-0308	Shoreline	SCAT T4 8/26/10	Patchy oiled debris and vegetation					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30834	-85.14092
EPA-C-0064	Shoreline/ Overbank	SCAT T1 8/18/10	Oil stain/film from mousse					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30715	-85.13877
EPA-C-0065	Shoreline/ Overbank	SCAT T1 8/18/10	Some heavy film, with flecks of oil located in vernal pools running alongside river					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30840	-85.14080





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

Division C: Mile Marker 11.5-11.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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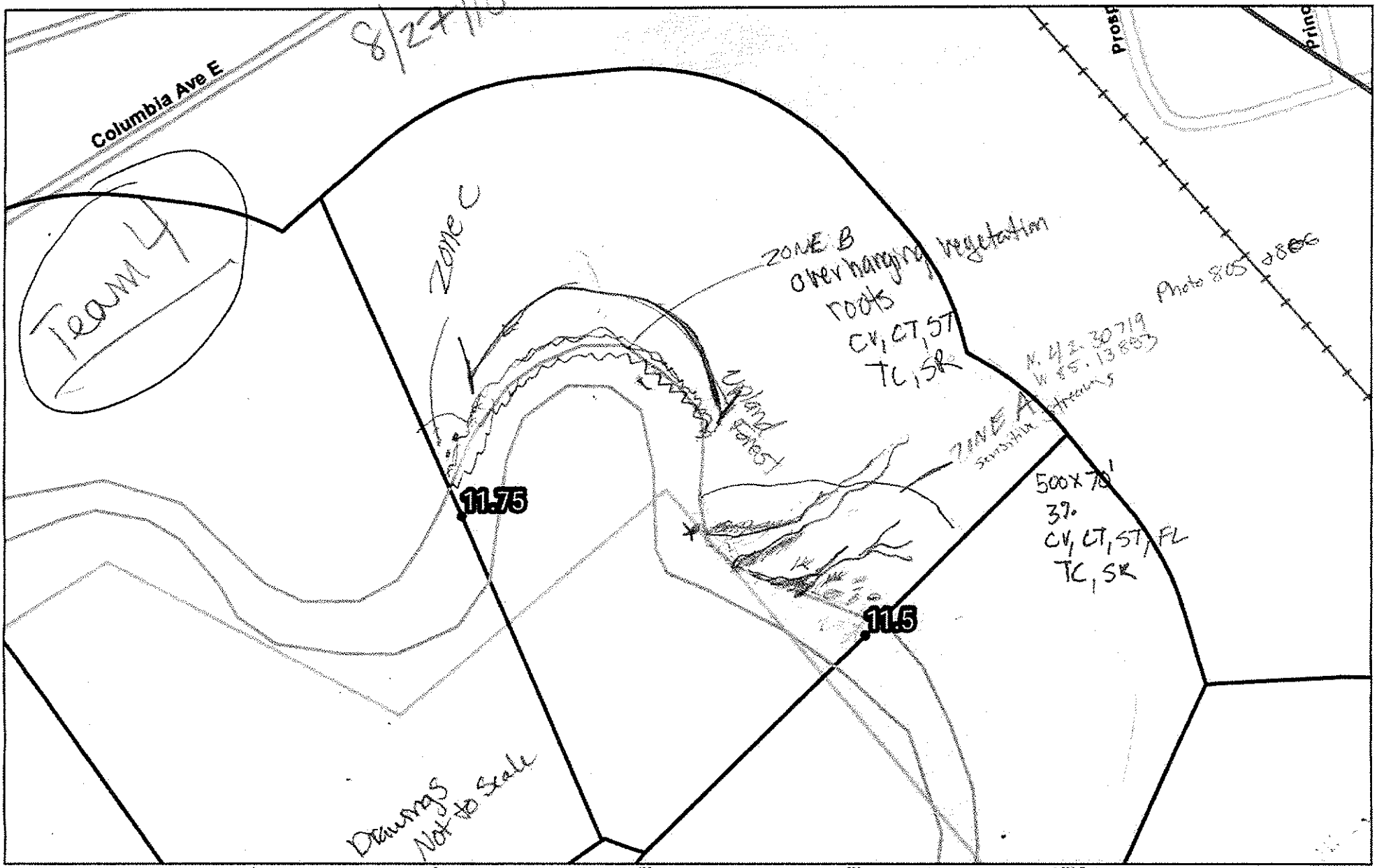
Coordinate System: NAD 1983 State Plane Michigan South Feet



QuartermileMarkers
Shoreline
River_QuarterMiles
Division

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET #: 48

ENTRIX
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www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIG TH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 091910 Time: AM / PM

Operations Division: C Segment ID: From 11.5 Start MP to End MP 11.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island

Weather: Sun/Cloud/Rain/Snow/ Cloudy

Field Inspection Team

Enbridge Inspector: CLVD Chad Vile

Division Supervisor(Contractor): [signature] Arnold Phillips

SCAT Reviewed – Description of Clean Up Required

All items outlined by SCAT were inspected.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 09-20-10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 11.50 **Start MP to End MP** 11.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature] PHILIP GARDNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recomendations

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recomendations

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recomendations

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recomendations

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 11.5-11.75 Left Bank While Looking Downstream											
EPA-C-0303	Shoreline	SCAT T2 8/28/10	oiled snag (woody debris oil stained overhanging veg along shoreline). photo 505 is looking downstream from 11.5 milepost					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30681	-85.13879	(Y) / N
EPA-C-0309	Shoreline	SCAT T2 8/28/10	continuation of previous Quarter mile zone; photo 506 is looking downstream from milepost 11.5; photo 507 shows oiled debris in zone A					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30668	-85.13909	(Y) / N
EPA-C-0310	Shoreline	SCAT T2 8/28/10	photo 508 shows pooled oil in zone B					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30691	-85.14006	(Y) / N
EPA-C-0311	Shoreline	SCAT T2 8/28/10	Throughout zone B numerous ponding follow for. GPs point along oiled path to large amounts of pooledoil; photo 510 shows pooled oil					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30741	-85.14034	Y / (N) M2
EPA-C-0312	Shoreline	SCAT T2 8/28/10	GPs notes beginning of shoreline impact. zone D ends about 100 feet upstream from milepost 11.75. photo 509 shows oiled vegetation					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30771	-85.13976	(Y) / N
EPA-C-0313	Shoreline	SCAT T2 8/28/10						Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30836	-85.13997	(Y) / N
SCC3-2	Shoreline	Shoreline Assessment					Floodplain needs closer inspection by foot.		42.30778	-85.14095	(Y) / N
SCC3-3	Shoreline	Shoreline Assessment	●		●		Overhanging vegetation and steep banks. Small boat ops / airboat, poison ivy on site.		42.30845	-85.14032	(Y) / N
SCC3-4	Shoreline	Shoreline Assessment	●		●		Floodplain heavily oiled approx 10m over banks.		42.30752	-85.13950	(Y) / N

Printed Team Member Names: MIKE ZAMBETIS (ENBRIDGE), HOWARD PHAM (USEPA), Kathleen Fairchild, DNRE

Date: 9/22/10

Comments:

NOTE:

SCAT RECOMMENDATIONS FOR THE SEGMENT WERE COMPLETED WITH THE EXCEPTION OF THOSE ASSOCIATED OF THAT ARE IN THE VICINITY OF EPA-C-0311 WHERE RECOMMENDATIONS HAD CHANGED PER USFWS DIRECTION SINCE SCAT WAS ORIGINALLY COMPLETED.

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 11.5-11.75 Left Bank While Looking Downstream Contd.											
EPA-C-0061	Main Channel	SCAT T2 8/14/10	WP72 - pool oil inlnand. 5 ft from shore. Black.					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30852	-85.14015	(Y) N
EPA-C-0062	Main Channel	SCAT T2 8/14/10	WP73 - back pool and free black oil 30 x 50 15:11					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30778	-85.14085	(Y) N

Printed Team Member Names: MIKE ZAMBETIS (ENBRIDGE), Howard Pham (US EPA). Kathleen Fairchild, DNRE

Date: 9/22/10

Comments:

EPA-C-0060 SCAT T1 (8/14) No comment Refer to Kalamazoo Enbridge Oil Cleanup Methods 42.307 -85.141 (Y) / N

PO-0004 (8/18) Pooled oil, remove pooled oil 42.307 -85.14 (Y) / N

PO-06 (8/16) Pooled oil, remove pooled oil 42.308 -85.141 (Y) / N

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 11.5-11.75 Right Bank While Looking Downstream											
EPA-C-0308	Shoreline	SCAT T4 8/26/10	Patchy oiled debris and vegetation					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30834	-85.14092	(Y) / N
EPA-C-0064	Shoreline/ Overbank	SCAT T1 8/18/10	Oil stain/film from mousse					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30715	-85.13877	(Y) / N
EPA-C-0065	Shoreline/ Overbank	SCAT T1 8/18/10	Some heavy film, with flecks of oil located in vernal pools running alongside river					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30840	-85.14080	(Y) / N

Printed Team Member Names: Mike Van Loon, Chris Conn, Ross DeRaeric
Date: 9/22/10
Comments:

PO-07 (8/16) Pooled oil, remove pooled oil 42.308 -85.14 (Y) / N
PO-08 (8/16) Series of oiled puddles, remove oil 42.308 -85.139 (Y) / N

Addendum to re-SCAT Assessment of Segment 11.75

Feature EPA-C-0311 on the LDB: This feature was not cleared (circled as yes) by the SCAT re-assessment team because the initial SCAT recommendations had not been performed. This area had been identified by the U.S. Fish and Wildlife Service as a diverse sensitive wetland that should be restored by natural attenuation rather than removal of impacted vegetation.

9/23/10
Joe McGaver, Enbridge Energy

Debora Snell 9/23/10
Debora Snell, MDNRE

Ann Whelan, USEPA

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From** 11^{50} **Start MP to End MP** 11^{75} **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Matt Boodson 9-20-10 Enbridge
Signature MATT BOODSON (date)

[signature] 9/20/10 EPA
Signature (date)

4. **SCAT Reassessment**

[signature] 9/22/10 Enbridge
Signature Michael Van Loan (date)

[signature] 9/22/1
MICHAEL A. ZAMBERLIN

R. del Rosario 9/22/10 EPA
Signature ROSS DEL ROSARIO (date)

Howard Pham. 9/22/10
HOWARD PHAM.

Chris Conn 9/22/10 MDNRE
Signature (date)

[signature] 9/22/10
Kathleen Fairchild

5. **EPA**

[signature] 9/24/10 EPA Division Supervisor
Signature (date)
Jordan Garrard

Appendix E
Photographs

Field Photo Log – Segment 11.75



Photo 0813 – Facing southeast at right descending overbank near SCC3-4.



Photo 0815 – Facing southeast at right descending bank near EPA-C-0064.

Field Photo Log – Segment 11.75



Photo 0820 – Facing north at right descending bank.



Photo 0822 – Facing northwest at right descending bank near EPA-C-0065.

Field Photo Log – Segment 11.75



Photo 0823 – Facing west at right descending overbank near EPA-C-0308.



Photo 0824 – Facing southwest at right descending bank near EPA-C-0065.

Field Photo Log – Segment 11.75



Photo 0825 – Facing east at left descending overbank near SCC3-3.



Photo 0828 – Facing southeast at left descending overbank near EPA-C-0312.

Field Photo Log – Segment 11.75



Photo 0830 – Facing southeast at left descending bank near EPA-C-0311.



Photo 0835 – Facing southwest at left descending overbank near EPA-C-0311.

Field Photo Log – Segment 11.75



Photo 0840 – Facing east at left descending bank near EPA-C-0311.



Photo 0841 – Facing southwest at left descending bank near EPA-C-0309.

Field Photo Log – Segment 11.75



Photo 0842 – Facing southwest at left descending overbank near EPA-C-0309.



Photo 0843 – Facing southwest at left descending overbank near EPA-C-0302.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 12.0 – MP 11.75 to 12.0

Enbridge Energy

September 23, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 12.0 had light levels of oil staining on the left descending bank. Oiled/overhanging vegetation was observed along the shoreline of the left descending bank. Areas of pooled oil and tar patches were also present on the mud flat, as well as signs of oiling in multiple channels on the left descending bank. In addition, there were signs of oiling along channel banks throughout this segment. A cluster of islands, located near EPA-C-0319, contained thickly coated vegetation, tarred overhanging vegetation and multiple tar patches. Zone C was present on three consecutive islands; stained and coated vegetation, surface residue and thick oil covering on the shoreline. Light levels of oil staining were present on the right descending bank. Zone D was present in a steep upland forest on the downstream portion of the right descending bank, consisting of overhanging vegetation and oiled woody debris along the shoreline. Patchy tar globs were present on vegetation and woody debris, as well as pockets of oil under and around downed logs. The right descending bank contained pools of water with sheen in the surrounding sediment. Special consideration was mentioned for a forested wetland floodplain present on the right descending bank. Zone A was observed within the wetland floodplain, containing large oil-covered woody debris, oiled vegetation and a large pool of oil at the base of an uprooted tree.

Actions

The shoreline clean-up activities within Segment 12.0 consisted of the following:

- Low pressure / high volume flush with downstream snare and boom capture;
- Vegetation removal, leaving roots intact and woody plants greater than 2" in diameter;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Removal of pooled oil using absorption techniques (snares/pom-pom, sorbent pads) and scraping to a limited depth;
- Mobilize and capture oil with boom or sorbent material before and during moving debris.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil is present in zone C as well as in the downstream portion of the left descending bank;
- Oiled debris is present in multiple locations on the left descending bank;
- Oiled woody vegetation is present midway along the left descending bank;
- Oiled woody vegetation is present in zone C on the left descending overbank;

- Oiled soil is present in zone C on the left descending overbank;
- Oiled woody vegetation is present on islands and in multiple locations along the right descending bank.
- Oiled soil is present on islands and the right descending bank.
- Oil sheen is present in zone C on the left descending bank and zone B on the right descending bank;
- Oiled rock and cobble are present in the upstream portion of the right descending bank.

Segment 12.0 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

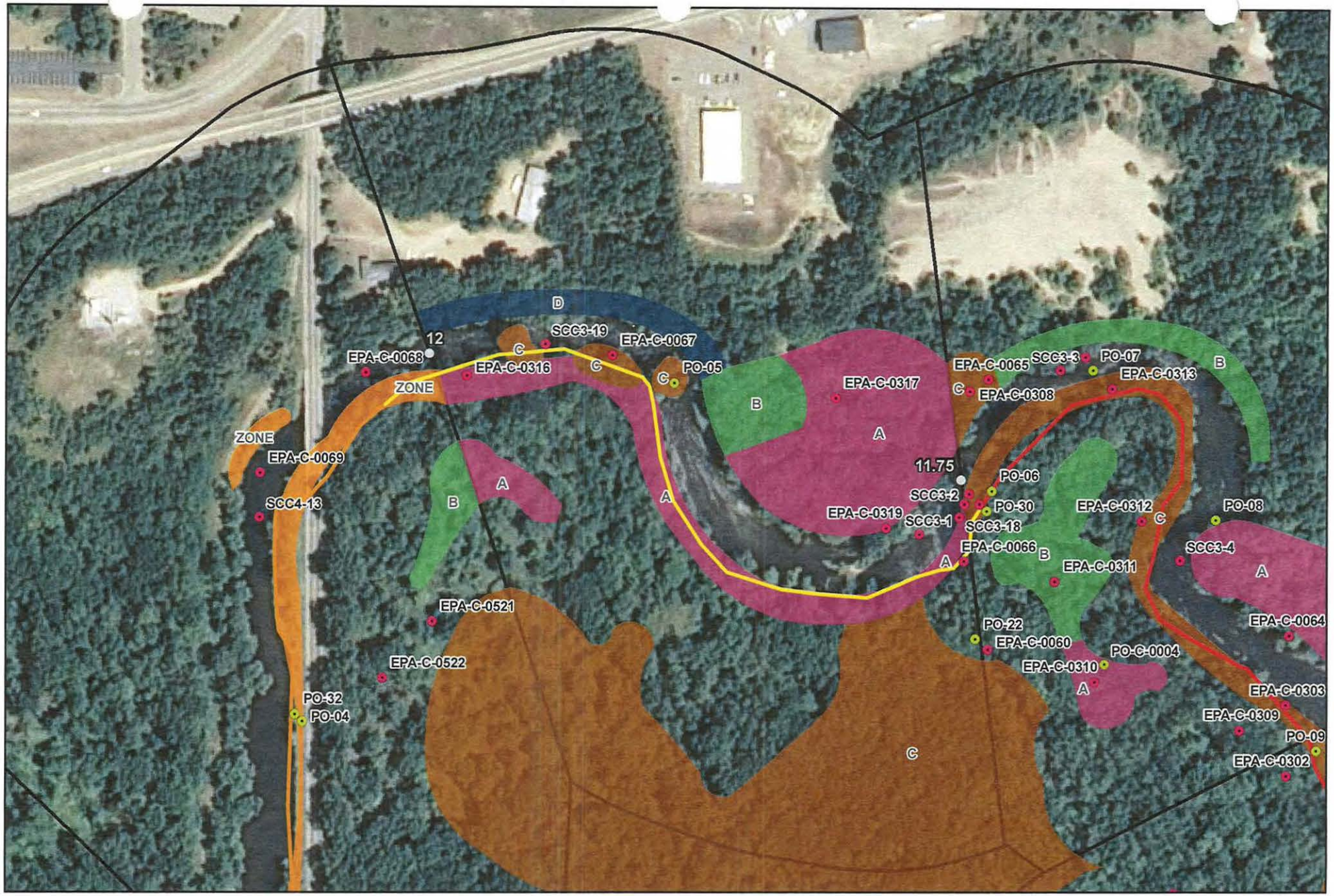
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 11.75-12 Left Bank While Looking Downstream										
EPA-C-0316	Shoreline	SCAT T1 8/27/10	Oiled veg, some pooled oil on mud flats (see GPS). Pool areas are bisected by a channel. Recommed removal of pooled oil/soils on the flats deep in the segment's forest. wp 80 (N42.3077; W85.14066) wp 81 (N42.30774; W85.14027) wp 82 (N42.30759; W85.140. Many channels in segment 12.0 with signs of oiling along banks. Tar patches are distributed on mud flats, and in some cases with pooled oil (note way points).					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30839	-85.14429
EPA-C-0067	Shoreline/ Overbank	SCAT T1 8/17/10	Two pooled areas (3m x 5m) approximately 5m offshore					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30850	-85.14332





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B B/C C D E F G H NO OIL ZONE

Division C: Mile Marker 11.75-12
Left Bank While Looking Downstream

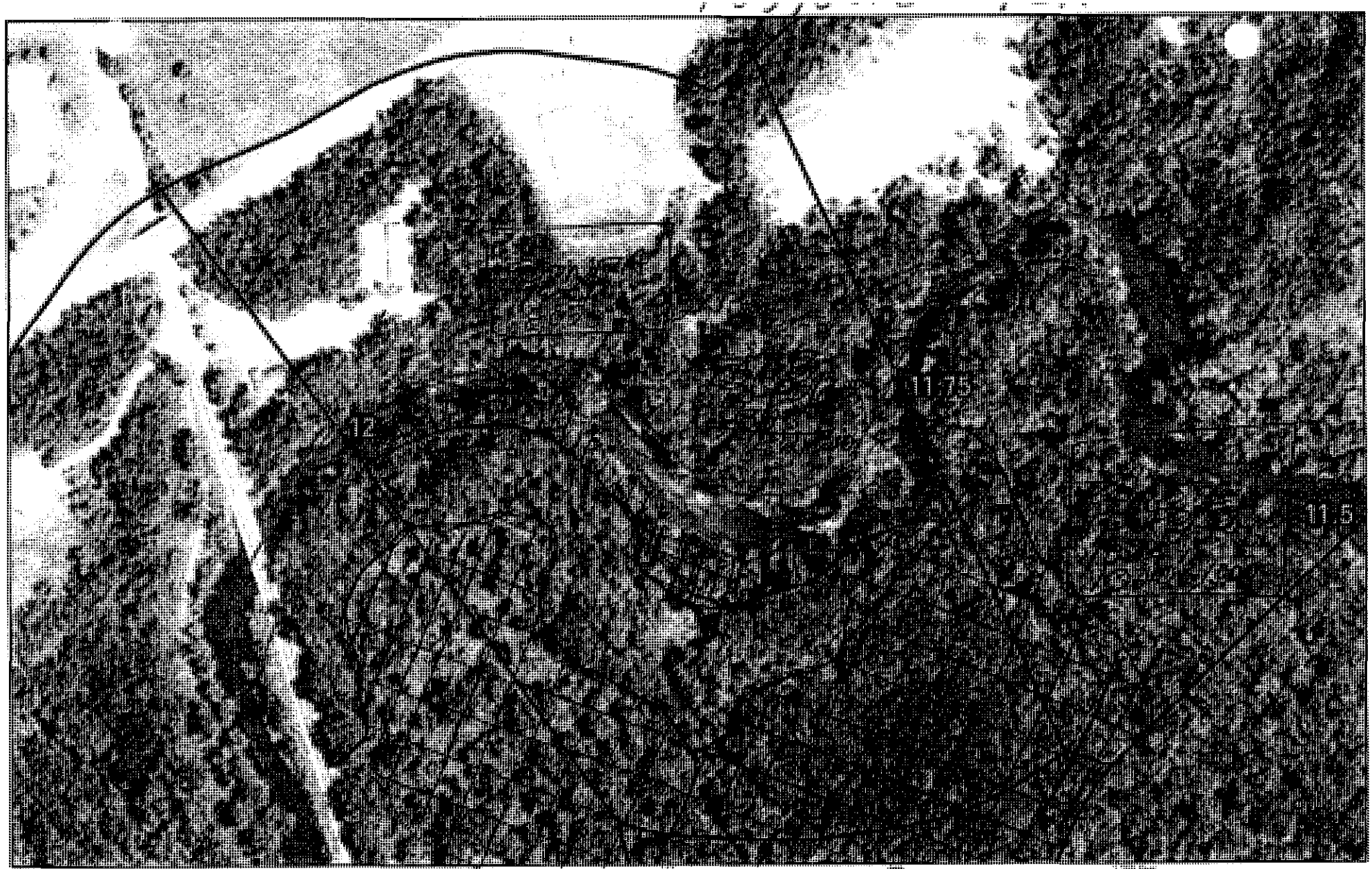
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



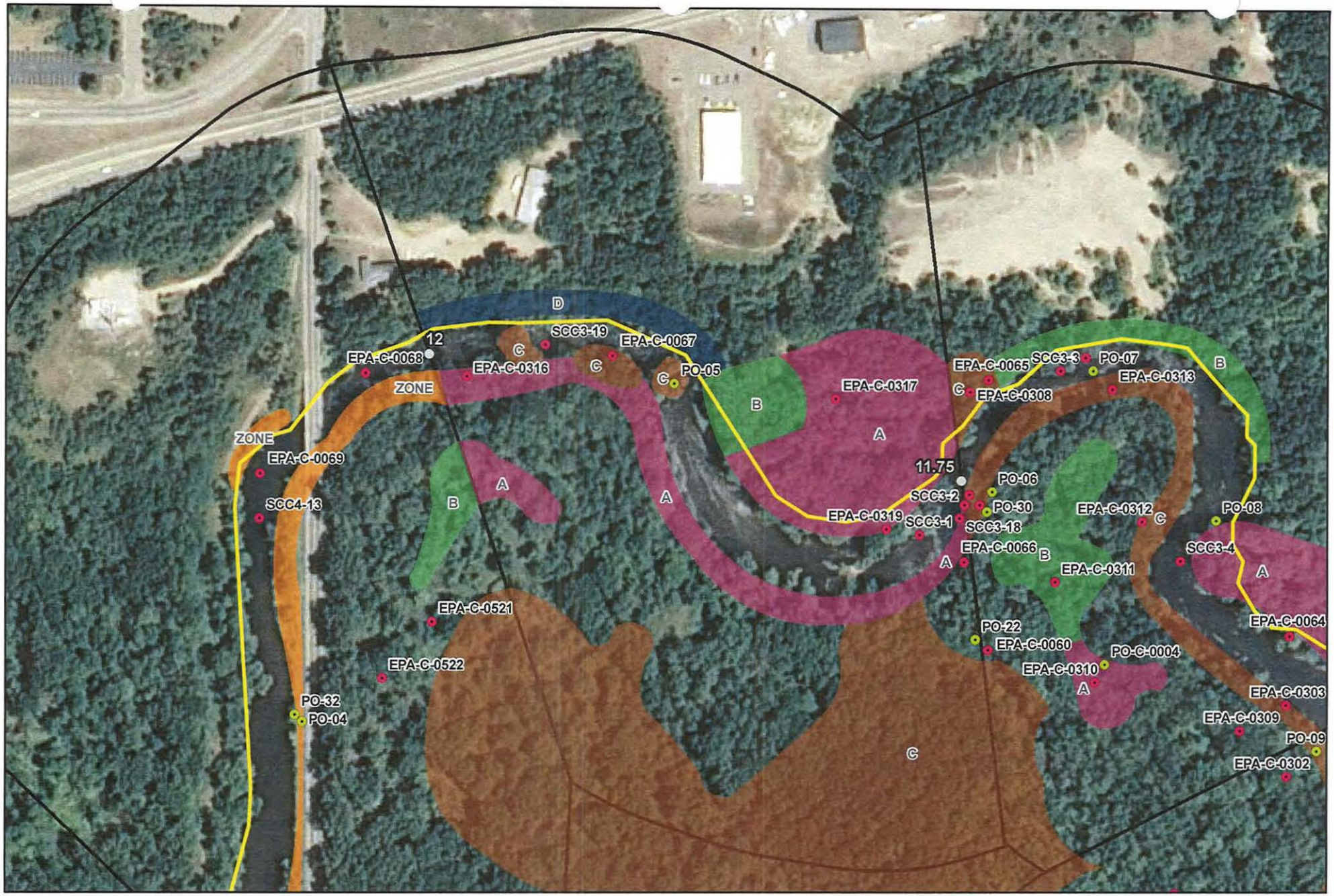
SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 11.75-12 Right Bank While Looking Downstream										
EPA-C-0317	Shoreline	SCAT T4 8/27/10	Photo #807 & 808. Photos 809 and 810 of uprooted root ball. Zone A consists of patchy, tar-covered veg. & large oil-covered wood debris (old downed trees). *Large (7 feet diam), DEEP pool of oil at base of uprooted tree. * ATV Tracks were found in mud.					In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil.	42.30830	-85.14182
EPA-C-0319	Shoreline	SCAT T4 8/27/10	Photo #811. This includes a cluster of 3 islands. Veg. is covered in thick tar. Overhanging branches also covered in tar. Portions of the island have thick tar patches (shere boots stick to ground).					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30766	-85.14147
SCC3-18	Shoreline	Shoreline Assessment	●		●	●	Floodplain oiling is heavy.		42.30772	-85.14098
SCC3-19	Shoreline	Shoreline Assessment	●		●	●	Floodplain oiling is heavy back to 8m.		42.30855	-85.14377





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

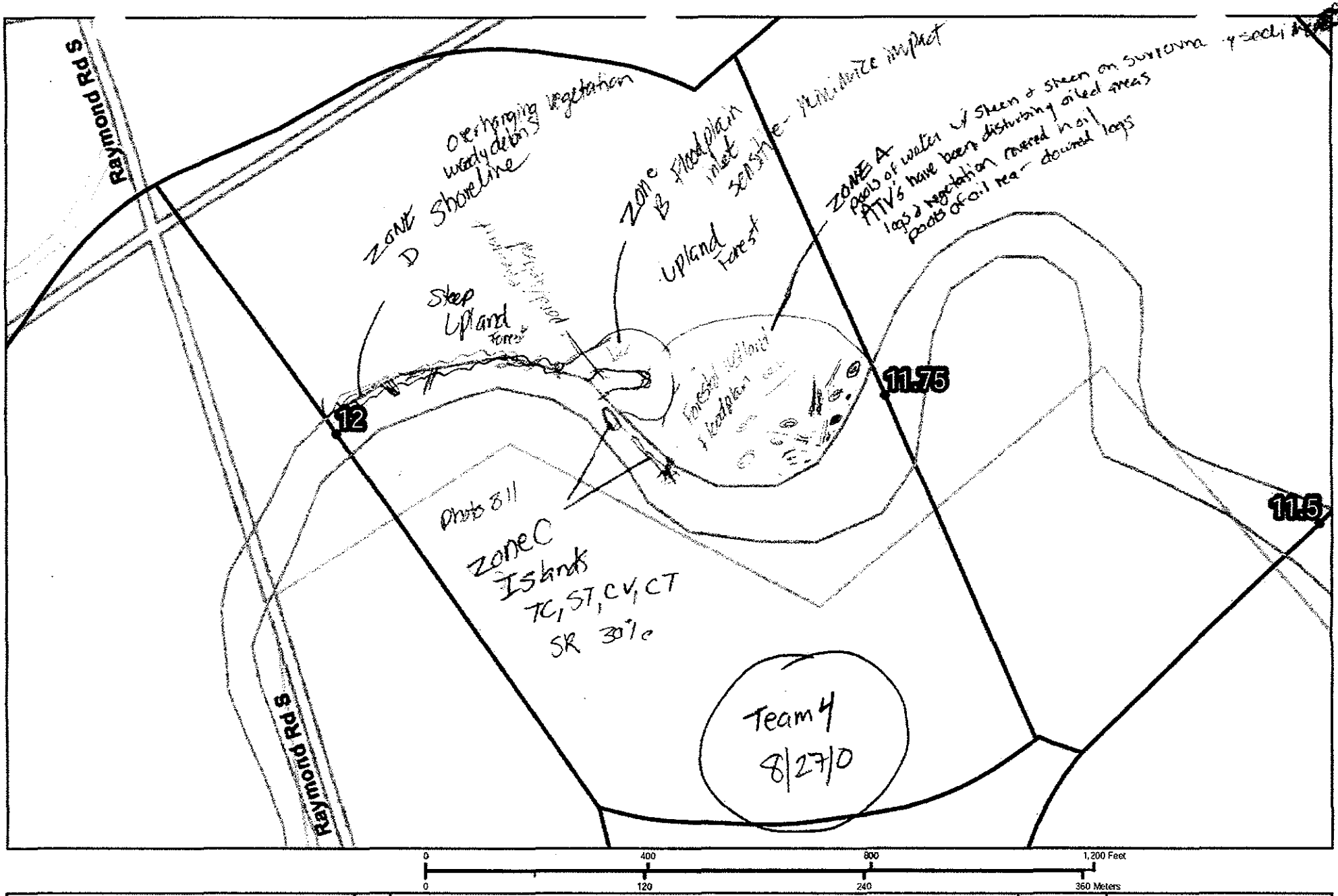
Division C: Mile Marker 11.75-12
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



Drawings not to scale

QuarterMileMarkers
Shoreline
River_QuarterMiles

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth, Down to Business.
www.entrix.com

Coordinate S... NAD 1983 STATE PLANE MIC... UTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/21/2010 **Time: AM / PM**

Operations Division: C **Segment ID: From** 11.75 **Start MP to End MP** 12.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/ SUN

Field Inspection Team

Enbridge Inspector: ROB KITCHEN

Division Supervisor(Contractor): CALEB T. KING

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

COMPLETE

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

COMPLETE

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

COMPLETE

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

COMPLETE – LARGE UP ROOTED TREE SHOULD BE CHECKED TO SEE IF MAINTENANCE IS REQUIRED

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 09/19/10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 11.75 **Start MP to End MP** 12.0 **Segment Length: 0.25 mile**

Bank: (LDB / RDB) ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Cloudy

Field Inspection Team

Enbridge Inspector: Chad Vie

Division Supervisor(Contractor): Arnold Phillips

SCAT Reviewed – Description of Clean Up Required

Reviewed all items reviewed by SCAT;

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 11.75-12 Left Bank While Looking Downstream											
EPA-C-0316	Shoreline	SCAT T1 8/27/10	Oiled veg, some pooled oil on mud flats (see GPS). Pool areas are bisected by a channel. Recommed removal of pooled oil/soils on the flats deep in the segment's forest. wp 80 (N42.3077; W85.14066) wp 81 (N42.30774; W85.14027) wp 82 (N42.30759; W85.140. Many channels in segment 12.0 with signs of oiling along banks. Tar patches are distributed on mud flats, and in some cases with pooled oil (note way points).					Cut and bag low hanging limbs extending over and into the water 2in above oiling level	42.30839	-85.14429	(Y) / N
EPA-C-0067	Shoreline/ Overbank	SCAT T1 8/17/10	Two pooled areas (3m x 5m) approximately 5m offshore					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30850	-85.14332	(Y) / N

Printed Team Member Names: Mike Van Loan, Chris Cona, Ross Delrosario
Date: 9/22/10
Comments:

EPA-C-0066 SCAT T1 (8/14) No comment please refer to the Kalamazoo Enbridge Oil Cleanup Methods
42.307 -85.141 (Y) / N

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMNET SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division C: Mile Marker 11.75-12 Right Bank While Looking Downstream											
EPA-C-0317	Shoreline	SCAT T4 8/27/10	Photo #807 & 808. Photos 809 and 810 of uprooted root ball. Zone A consists of patchy, tar-covered veg. & large oil-covered wood debris (old downed trees). *Large (7 feet diam), DEEP pool of oil at base of uprooted tree. * ATV Tracks were found in mud.					In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil.	42.30830	-85.14182	Y / N
EPA-C-0319	Shoreline	SCAT T4 8/27/10	Photo #811. This includes a cluster of 3 islands. Veg. is covered in thick tar. Overhanging branches also covered in tar. Portions of the island have thick tar patches (shere boots stick to ground).					* For Operational Focus areas not listed in this chart refer to the Kalamazoo River/Embridge Spill-Cleanup Recommendation Methods	42.30766	-85.14147	Y / N
SCC3-18	Shoreline	Shoreline Assessment	●		●	●	Floodplain oiling is heavy.		42.30772	-85.14098	Y / N
SCC3-19	Shoreline	Shoreline Assessment	●		●	●	Floodplain oiling is heavy back to 8m.		42.30855	-85.14377	Y / N

Printed Team Member Names: Mike Van Loan, Chris Conn, Ross Delrosario
Date: 9/22/10
Comments:

PO-05 (8/16) Remove pooled oil 42.308 -85.143 Y / N

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION **Operations Division:** C **Segment ID: From** 11.75 **Start MP to End MP** 12.00 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Matt Bordson 9-20-10 Enbridge
Signature MATT BORDSON (date)

[signature] 9/20/10 EPA
Signature (date)

4. **SCAT Reassessment**

[signature] 9/22/10 Enbridge
Signature (date)

[signature] 9/22/10 EPA
Signature ROSS DEL ROSARIO (date)

[signature] 9/22/10 MDNRE
Signature Chris Conn (date)

5. **EPA**

[signature] 9/24/10 EPA Division Supervisor
Signature Jordan Garrard (date)

O+M required @ SCAT Point EPA-C-0317 and drainage channels within overbank excavation on left bank. Hard boom deployed.

Appendix E
Photographs

Field Photo Log – Segment 12.0



Photo 0724 – Facing east at left descending bank near EPA-C-0316.



Photo 0726 – Facing southeast at left descending overbank near SCC3-19.

Field Photo Log – Segment 12.0



Photo 0728 – Facing south at left descending bank near EPA-C-0067.



Photo 0732 – Facing southeast at left descending bank in zone A.

Field Photo Log – Segment 12.0



Photo 0737 – Facing south at left descending overbank near EPA-C-0060 in zone C.



Photo 0741 – Facing east at left descending bank near SCC3-18 in zone C.

Field Photo Log – Segment 12.0



Photo 0743 – Facing south at left descending overbank near EPA-C-0062/EPA-C-0063/SCC3-2 in zone C.



Photo 0745 – Facing northeast at right descending bank near EPA-C-0308.

Field Photo Log – Segment 12.0



Photo 0746 – Facing east at right descending bank.



Photo 0749 – Facing northeast at right descending bank near EPA-C-0319.

Field Photo Log – Segment 12.0



Photo 0751 – Facing north at right descending bank near EPA-C-0317.



Photo 0752 – Facing northwest at right descending overbank near EPA-C-0328.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 12.25 – MP 12.00 to 12.25

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 12.25 had light and moderate oiling on the left descending bank and light oiling on the right descending bank. The overbank areas contained areas of pooled oil on the left overbank in Zones A & B. Islands were not present. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 12.25 consisted of the following.

- Removal of pooled oil
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along left descending bank near MP 12.25
- Oiled woody vegetation on left descending bank near MP 12.25 and on right descending bank near MP 12.25, MP 12.00 and EPA-C-0069

Segment 12.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

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  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

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  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

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Oil Distribution			Surface Oiling Descriptors - Width	
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B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

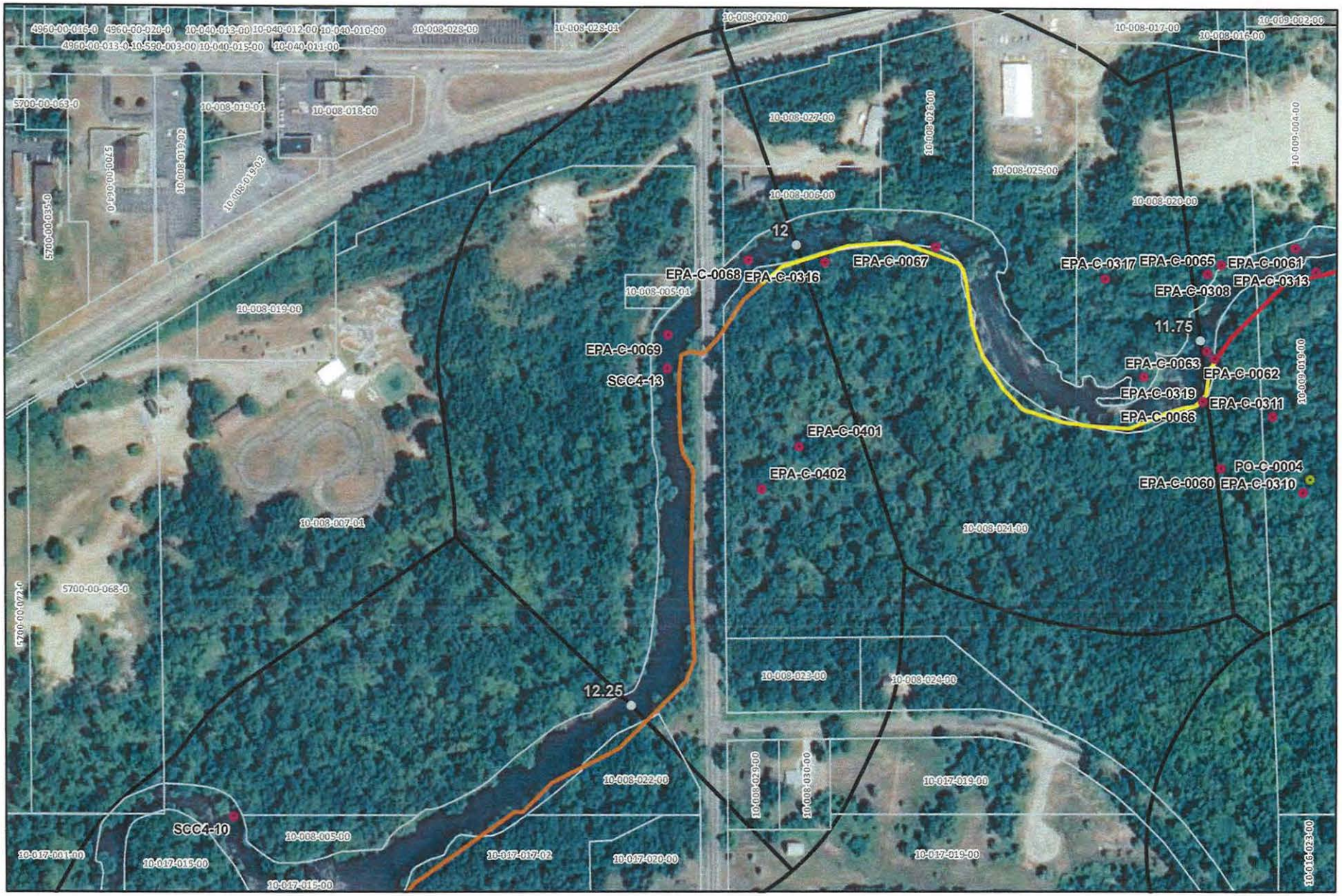
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 12-12.25 Left Bank While Looking Downstream										
SCC4-13	Shoreline	Shoreline Assessment	●				Cut brush. Deploy from C4. High volume flush.		42.30768	-85.14567
EPA-C-0068	Main Channel	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30840	-85.14497





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 12-12.25 Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

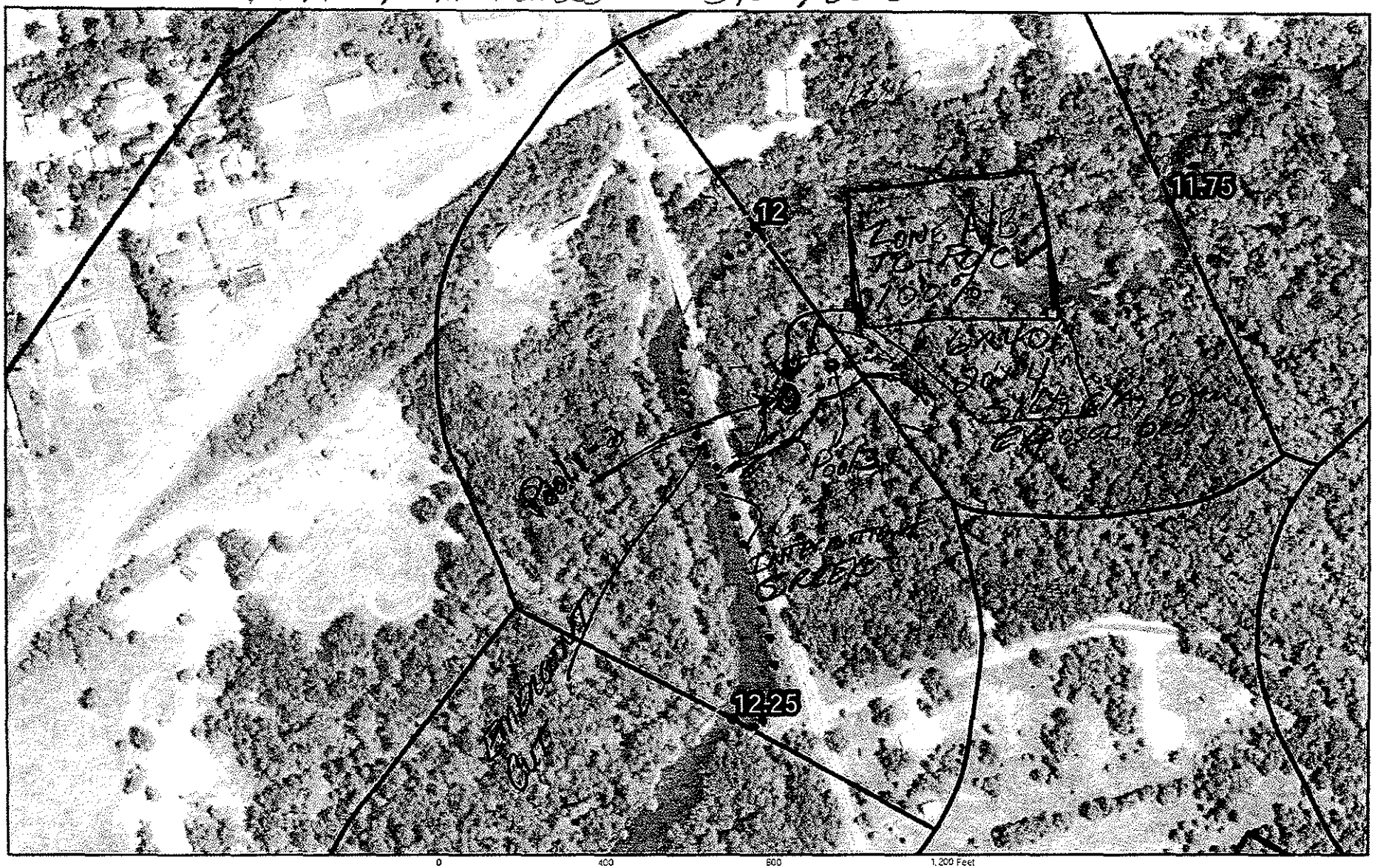
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TERM 1 MP 12.25 3/27/2010



Quartermile Markers
Shoreline
River_QuarterMiles
Divisions

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Division C: Mile Marker 12 - 12.25 Left Bank while looking downstream

Image: 2009 NAIP

SHEET #: 48

ENTRIX
Down to Earth, Down to Business
www.entrix.com

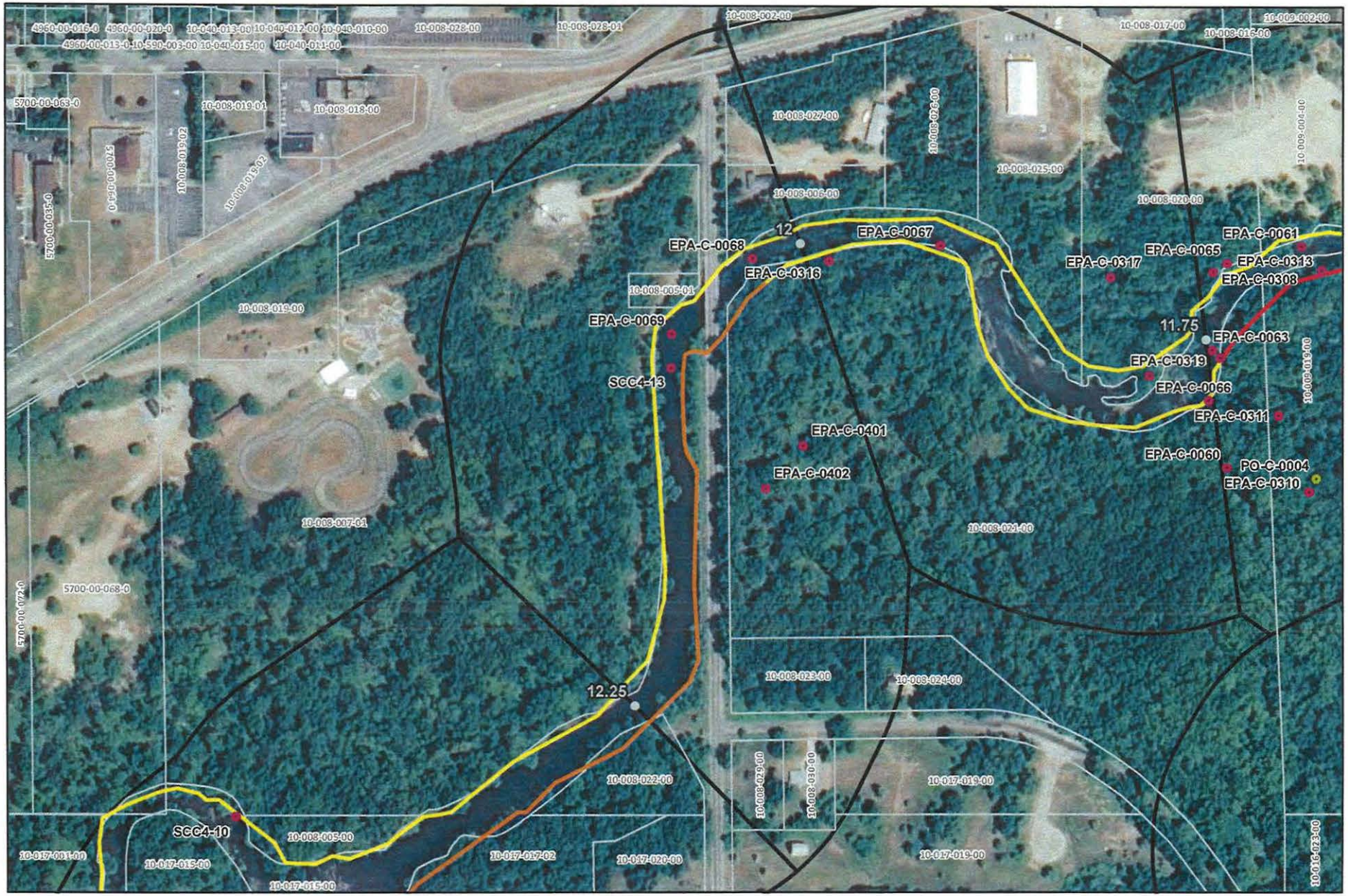
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

T 3/27

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 12-12.25 Island										
EPA-C-0401	Shoreline & Overbank	SCAT T1 8/30/10	Follow channel all the way down (southeast) because this is where the oil landed. Area just downstream from mile post 12.0 has been cleared and cleaned. No oil observed on shoreline. pic 1012550 pooled oil; 1012551 oiled ditch wildlife tracks observed in mud flag 1					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30718	-85.14450
EPA-C-0402	Shoreline & Overbank	SCAT T1 8/30/10	Follow channel all the way down (southeast) because this is where the oil landed. Area just downstream from mile post 12.0 has been cleared and cleaned. No oil observed on shoreline. flag2open silty clay loam Zone A and Zone B are close together, similar characteristics; note different flags and coordinates. Pooled oil is associated with narrow channel which traverses segemt and the one to the east.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.3069	-85.14483





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 12-12.25 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

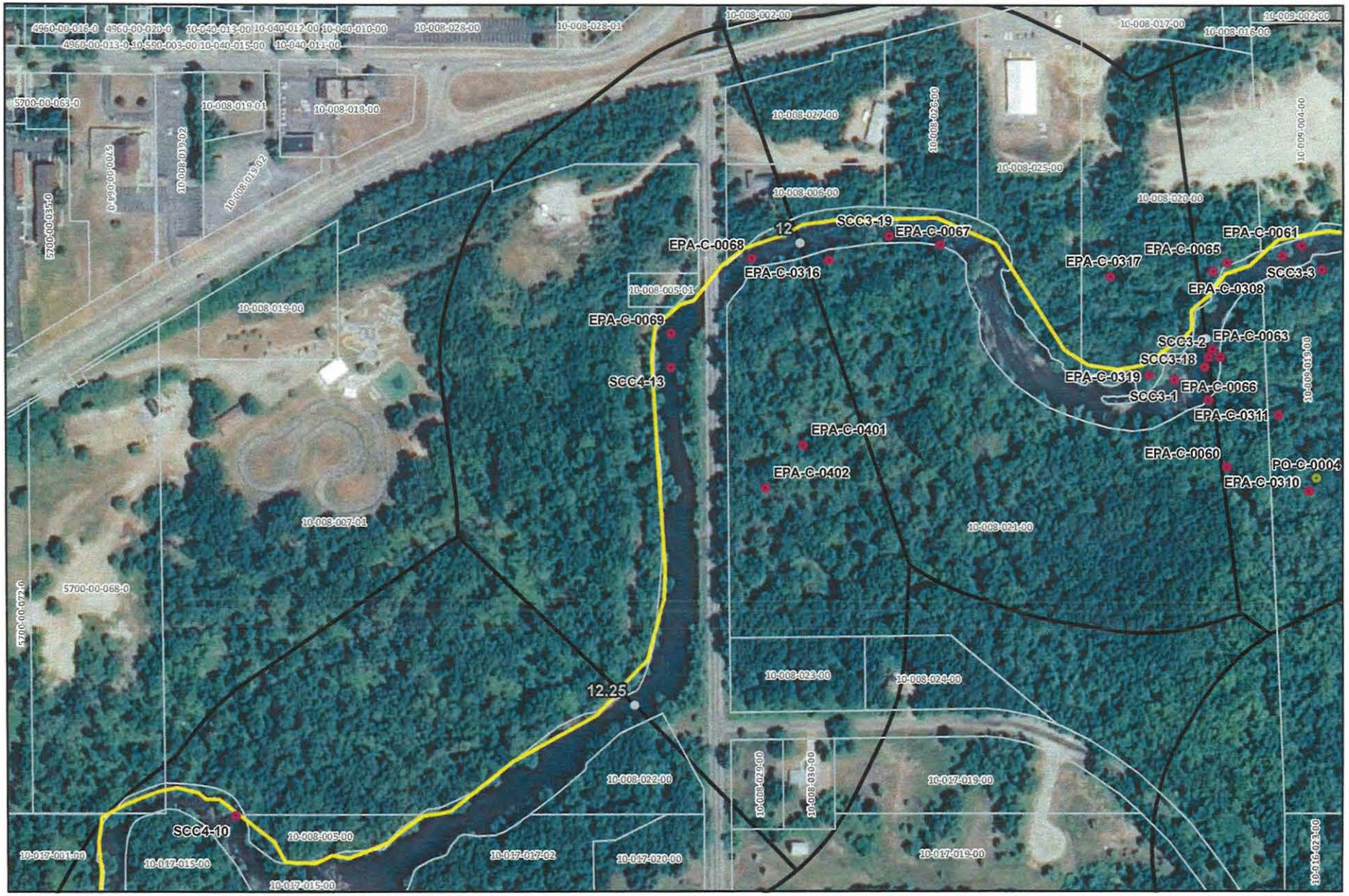
ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 12-12.25 Right Bank While Looking Downstream										
EPA-C-0069	Main Channel	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30790	-85.14567





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 12-12.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/11/10 **Time: AM / PM** 8:30

Operations Division: C **Segment ID: From** 12.00 **Start MP to End MP** 12.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Jeff Reynolds

Division Supervisor(Contractor): PHILIP GIANCONTA

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected & complete

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected & complete

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected & complete

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected & completed

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 09/1/10 Time: AM / PM 1230

Operations Division: C Segment ID: From 12 Start MP to End MP 12.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island

Weather: Sun/Cloud/Rain/Snow/ Cloudy

Field Inspection Team

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): PHILIP GARDNER

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work completed.

Punchlist Items Identified

☐ Punchlist Items Complete (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 12-12.25 Left Bank While Looking Downstream											
SCC4-13	Shoreline	Shoreline Assessment	•				Cut brush. Deploy from C4. High volume flush.		42.30768	-85.14567	(Y) / N
EPA-C-0068	Main Channel	SCAT T1 8/14/2010	~~This~~ is on RDB					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30840	-85.14497	(Y) / N
EPA-C-0475 EPA-C-0521	Overbank	SCAT T1 08/30/2010	Follow channel all the way down (southeast) because this is where the oil landed. Area just downstream from mile post 12.0 has been cleared and cleaned. No oil observed on shoreline. pic 1012550 pooled oil; 1012551 oiled ditch wildlife tracks observed in mud flag 1					Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	42.30718	-85.14450	(Y) / N
EPA-C-0402 EPA-C-0522	Shoreline & Overbank	SCAT T1 08/30/2010	flag2 open silty clay loam. Zone A and Zone B are close together, similar characteristics; note different flags and coordinates. Pooled oil is associated with narrow channel which traverses segemt and the one to the east. pics 2550, 2551. Follow channel all the way down (southeast) because this is where the oil landed. Area just downstream from mile post 12.0 has been cleared and cleaned. No oil observed on shoreline.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30690	-85.14483	(Y) / N

Printed Team Members Name: Bill Bates, Kenneth Mroczkowski, MDNRE, Amanda Bohnenblust, Enbridge

Date: 9/13/10 Team 1

Comments:

sorbent pads are still in creek near flag HA #4

oiled veg still present WP 126 N: 42.30727, W -085.14405

Called Debb about Zone C she said that they did not identify anything

EPA-C-0402, -0401 are mark @ waters edge but areas are further inland. These ids where also changed to new numbers

EPA-C-0475 / 401 changed to 521 in map
EPA-C-0402 is changed to 522

EPA-C-0316 was investigated in previous SCAT Recommendations Table
PO-04 Pooled oil, remove pooled oil in culvert 42.307 -85.145 (Y) / N
PO-32 Pooled oil, remove pooled oil in culvert 42.307 -85.145 (Y) / N

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill											
OPERATIONS CLEANUP RECOMMENDATIONS											
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 12-12.25 Right Bank While Looking Downstream											
EPA-C-0069	Main Channel	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30790	-85.14567	Y N

Printed Team Members Name: BILL BATES Amanda Bonnenblust, Enbridge, Kenneth Mroczkowski MDNRE

Date: 9/13/10

Comments:

Team 1

point EPA-C-0069, this point was not found.

additional point on RDB # SW-2 - looks like brush was cut

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 12-12.25 Island											
EPA-C-0401	Shoreline & Overbank	SCAT T1 8/30/2010	Follow channel all the way down (southeast) because this is where the oil landed. Area just downstream from mile post 12.0 has been cleared and cleaned. No oil observed on shoreline. pic 1012550 pooled oil; 1012551 oiled ditch wildlife tracks observed in mud flag 1					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30718	-85.14450	(Y) / N
EPA-C-0402	Shoreline & Overbank	SCAT T1 8/30/2010	Follow channel all the way down (southeast) because this is where the oil landed. Area just downstream from mile post 12.0 has been cleared and cleaned. No oil observed on shoreline. flag2open silty clay loam Zone A and Zone B are close together, similar characteristics; note different flags and coordinates. Pooled oil is associated with narrow channel which traverses segemt and the one to the east.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.3069	-85.14483	(Y) / N

Printed Team Members Name: Bill Bates Amanda Bohnenblust, Enbridge, Kenneth Mroczkowski, MDNRE

Date: 9/13/10

Team 1

Comments: There is no island, these points are on LDB

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 12.00 to MP 12.25 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley 11-Sept-2010 (date) Enbridge

Signature Eduardo Rovira 9/11/10 (date) EPA

4. **SCAT Reassessment**

Signature Amanda Bohnenblust 9/13/10 (date) Enbridge

Signature William J Bates 9/13/10 (date) EPA

Signature Kenneth M. Mroczkowski 09/13/10 (date) MDNRE

5. **EPA**

Signature JASON MUSANTE 9.18.10 (date) EPA Division Supervisor

Appendix E
Photographs

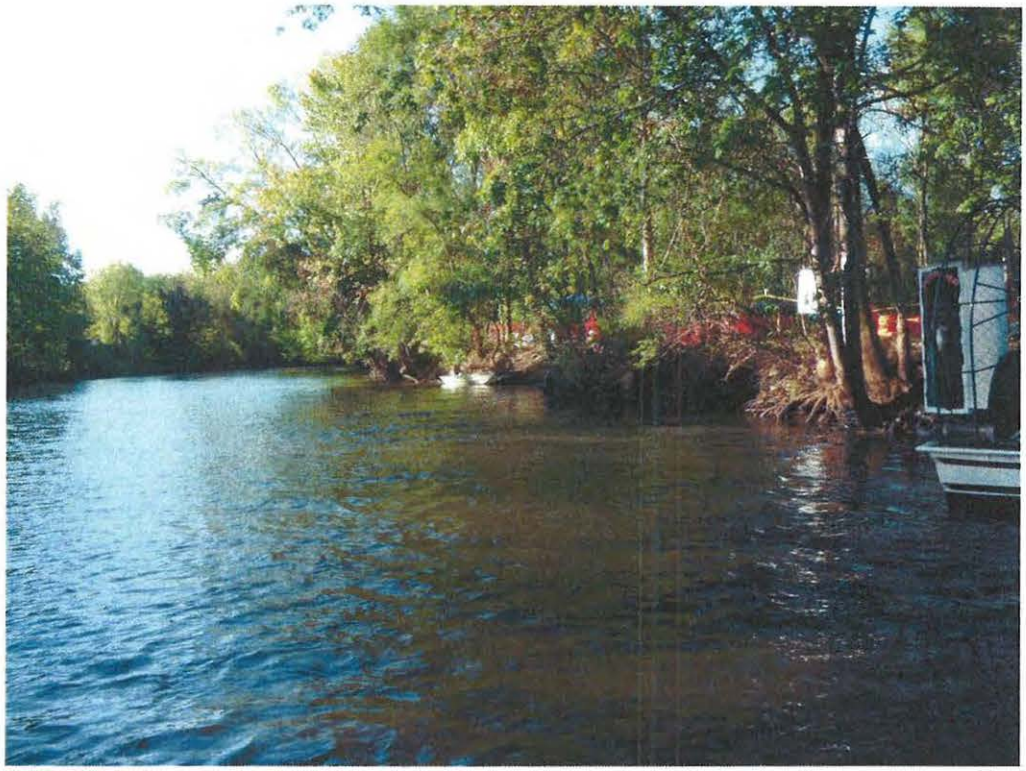


Photo 0336 – Looking northwest at right descending bank.

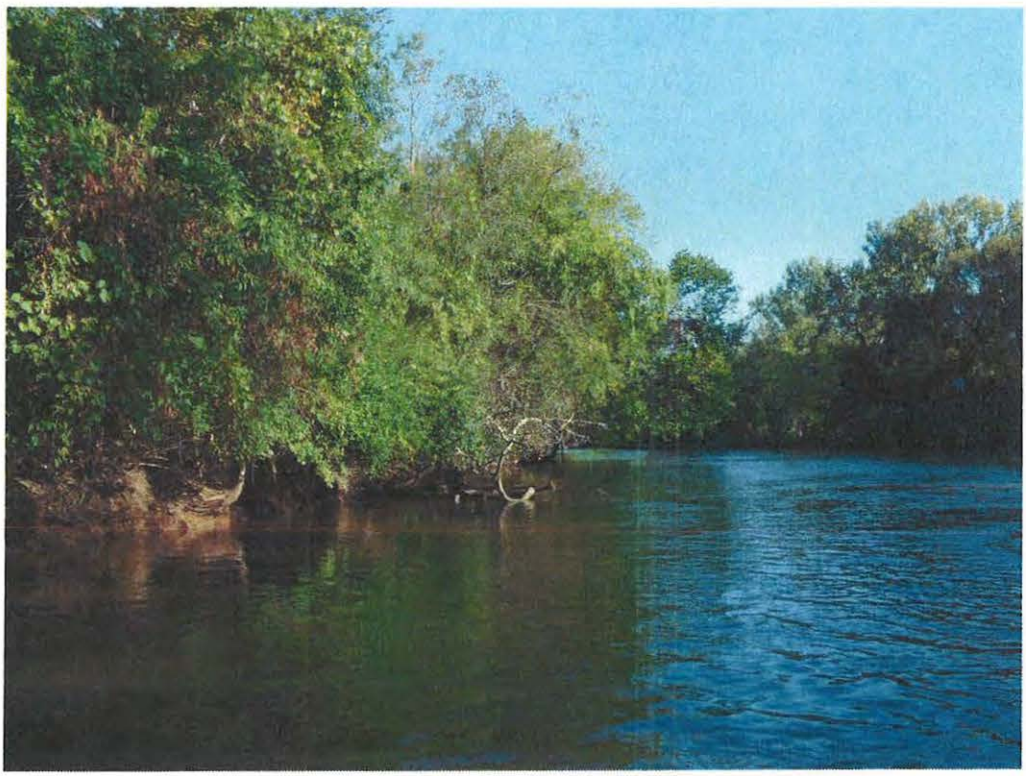


Photo 0338 – Looking north at right descending bank.



Photo 0359 – Looking north at left descending bank. Near PO-04 & PO-32.



Photo 0361 – Looking northeast at left descending bank. Near SCC4-13.

Field Photo Log – Segment MP 12.25

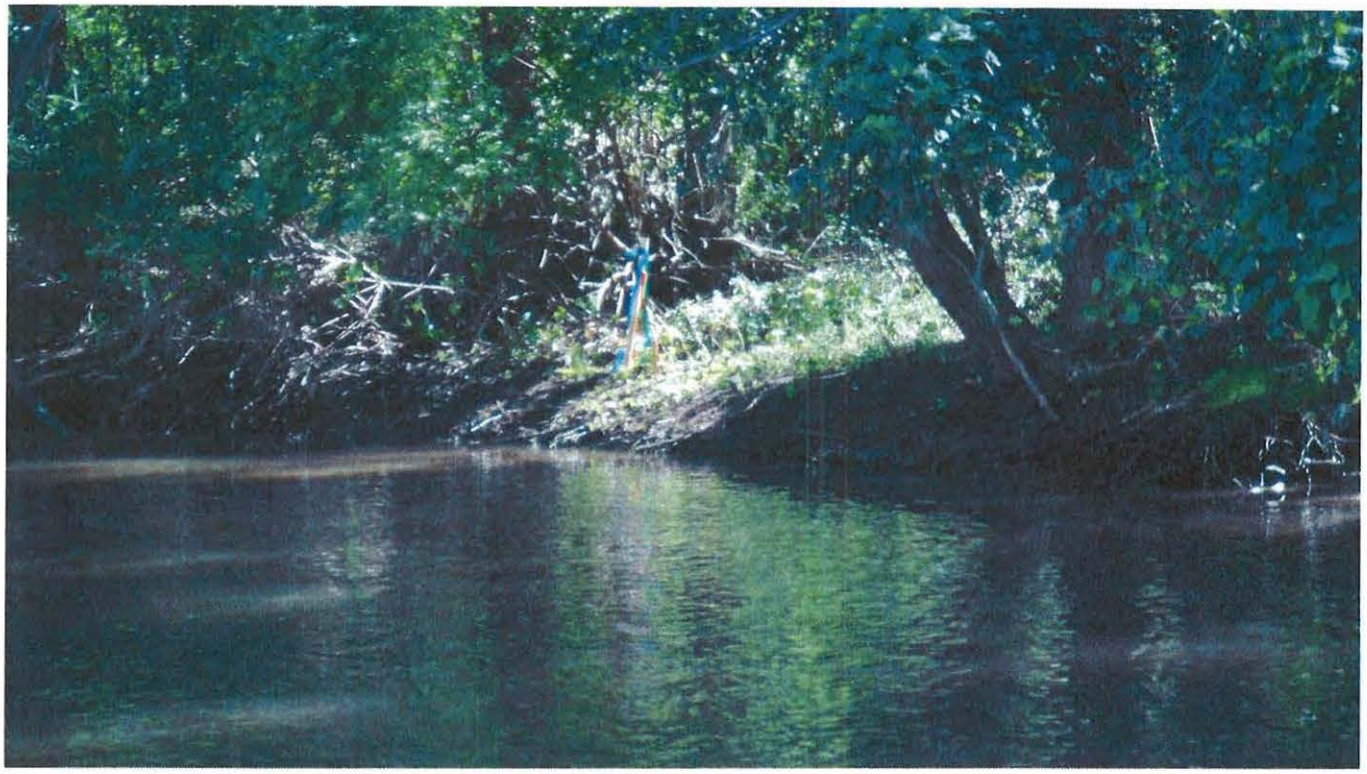


Photo 0362 – Looking northeast at left descending bank. Near EPA-C-0402.

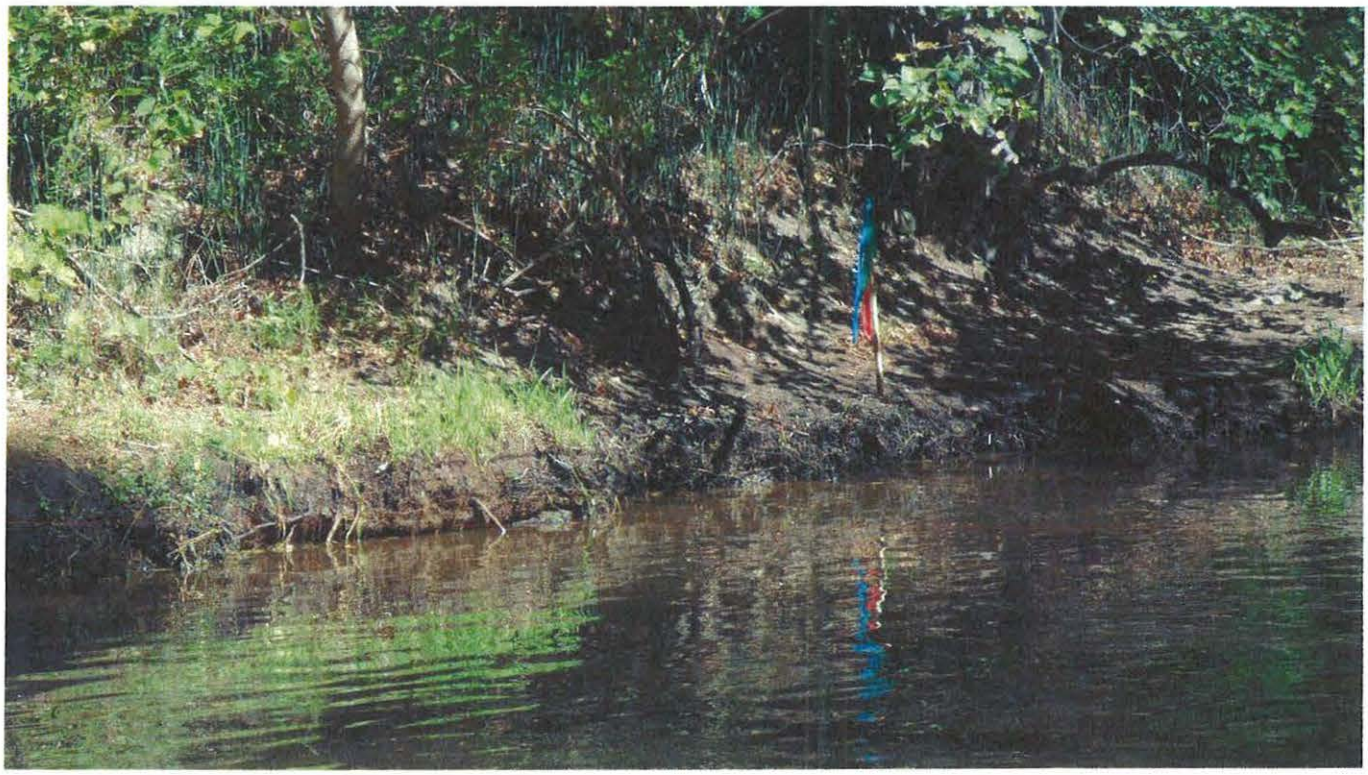


Photo 0363 – Looking northeast at left descending bank. Near EPA-C-0068.



Photo 0364 – Looking southwest at left overbank. Near EPA-C-0521.



Photo 0365 – Looking south at left overbank. Near EPA-C-0522.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 12.50 – MP12.25 to 12.50

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 12.50 had moderate oiling on the left descending bank including oiled debris and small amounts of pooled oil. The right descending bank had light oiling. The overbank of the main channel contained no areas requiring clean-up. The island had oiled vegetation along shore and an oiled forested wetland in the island interior. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 12.50 consisted of the following.

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris
- Removal of overhanging limbs

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled debris along right descending bank near the island and along island's upstream end
- Oiled woody vegetation on right descending bank near island and along islands north half
- Oiled woody along the left descending bank near MP 12.50 and MP 12.25

Segment 12.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 12.25-12.5 Left Bank While Looking Downstream										
EPA-C-0322	Shoreline	SCAT T2 8/28/2010	mousse along debris in water veg had been trimmed in this area. Overall Good. oil on mud-no recommendations. Submerged pompoms 50' upstream of MP 12.75. photo 513 shows mousse, oiled debris; photo 512 is looking downstream. see comments in zone A					Boom should be moved off shore.	42.30403	-85.14836
SCC4-10	Shoreline	Shoreline Assessment	●	●		●	Logjam. Small amt of pooled oil, use hand snare. Remove oil debris. High volume flush.		42.30473	-85.14947
SCC4-12	Shoreline	Shoreline Assessment	●		●	●	High impact grass flat. Deploy from C4 flush and deflects to existing skim ops.		42.30357	-85.14933





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 12.25-12.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

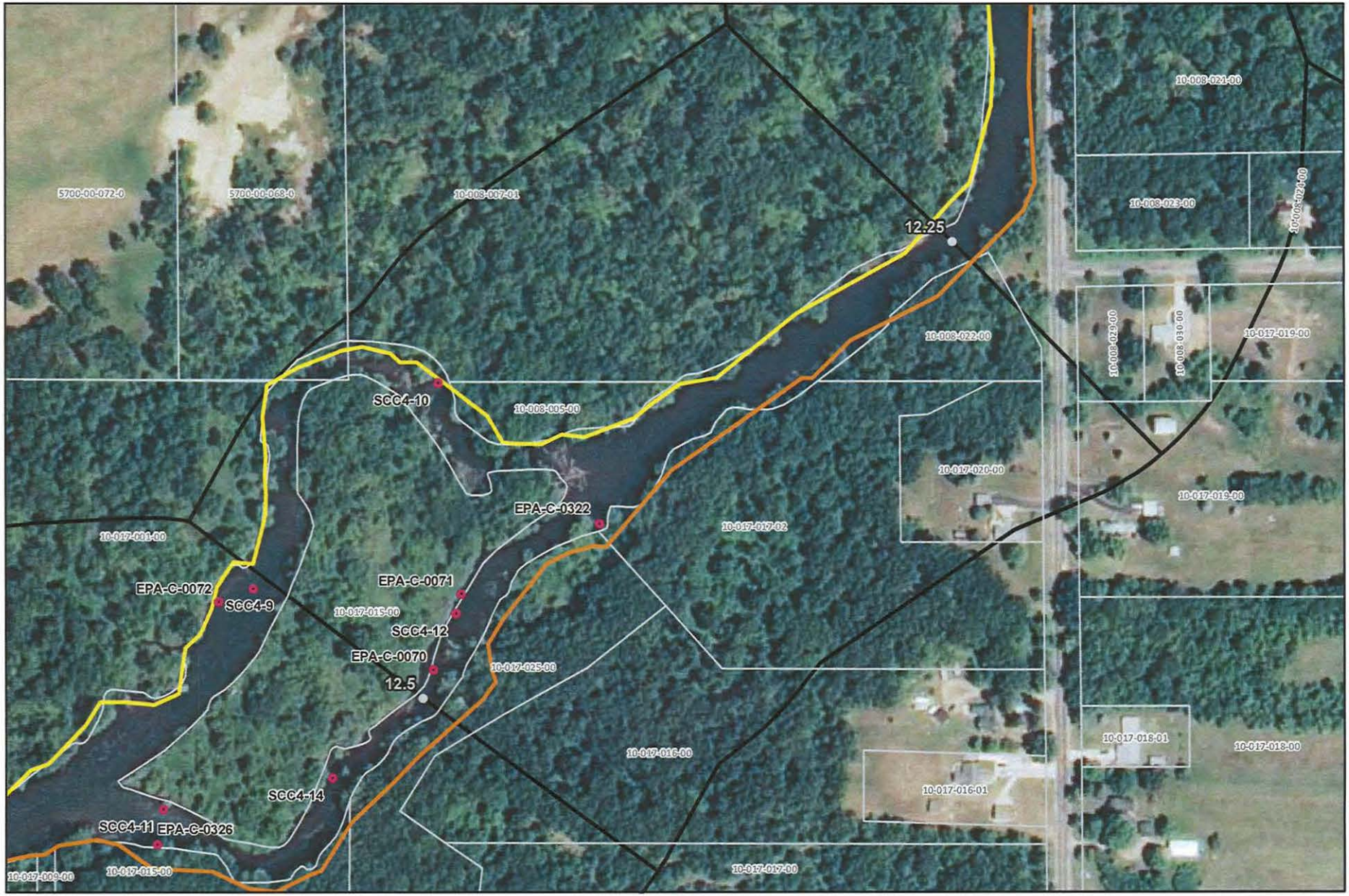
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 12.25-12.5 Island										
EPA-C-0070	Shoreline & Overbank	SCAT T1 8/17/2010	Vegetation on island impacted					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30328	-85.14948



Division C: Mile Marker 12.25-12.5 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

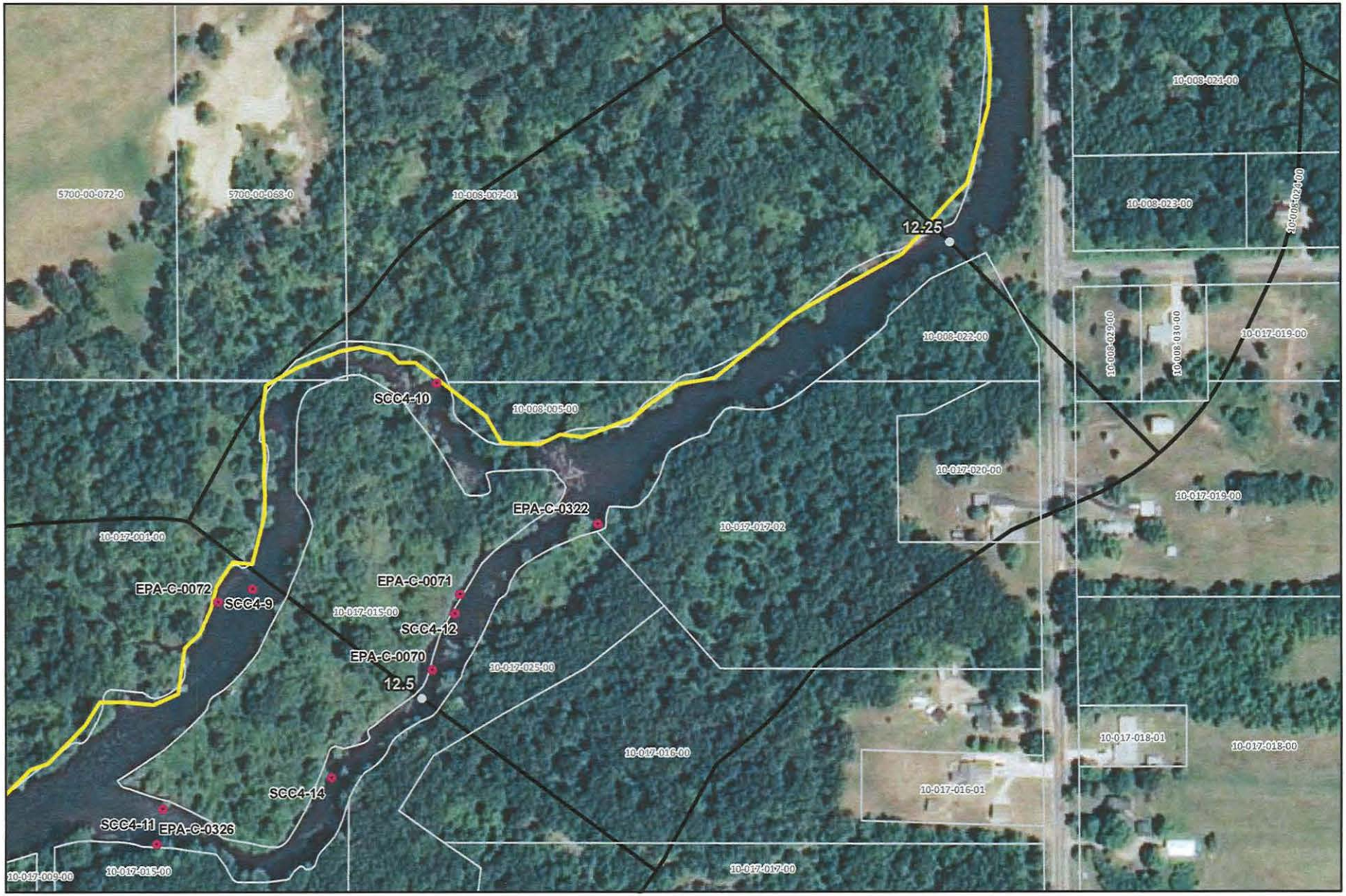
Source: Aerial Photography: USDA, 2009.

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 12.25-12.5 Right Bank While Looking Downstream										
EPA-C-0071	Shoreline	SCAT T1 8/18/2010	forested wetland with staining/coating of surface oil residue					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30367	-85.14930





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 12.25-12.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

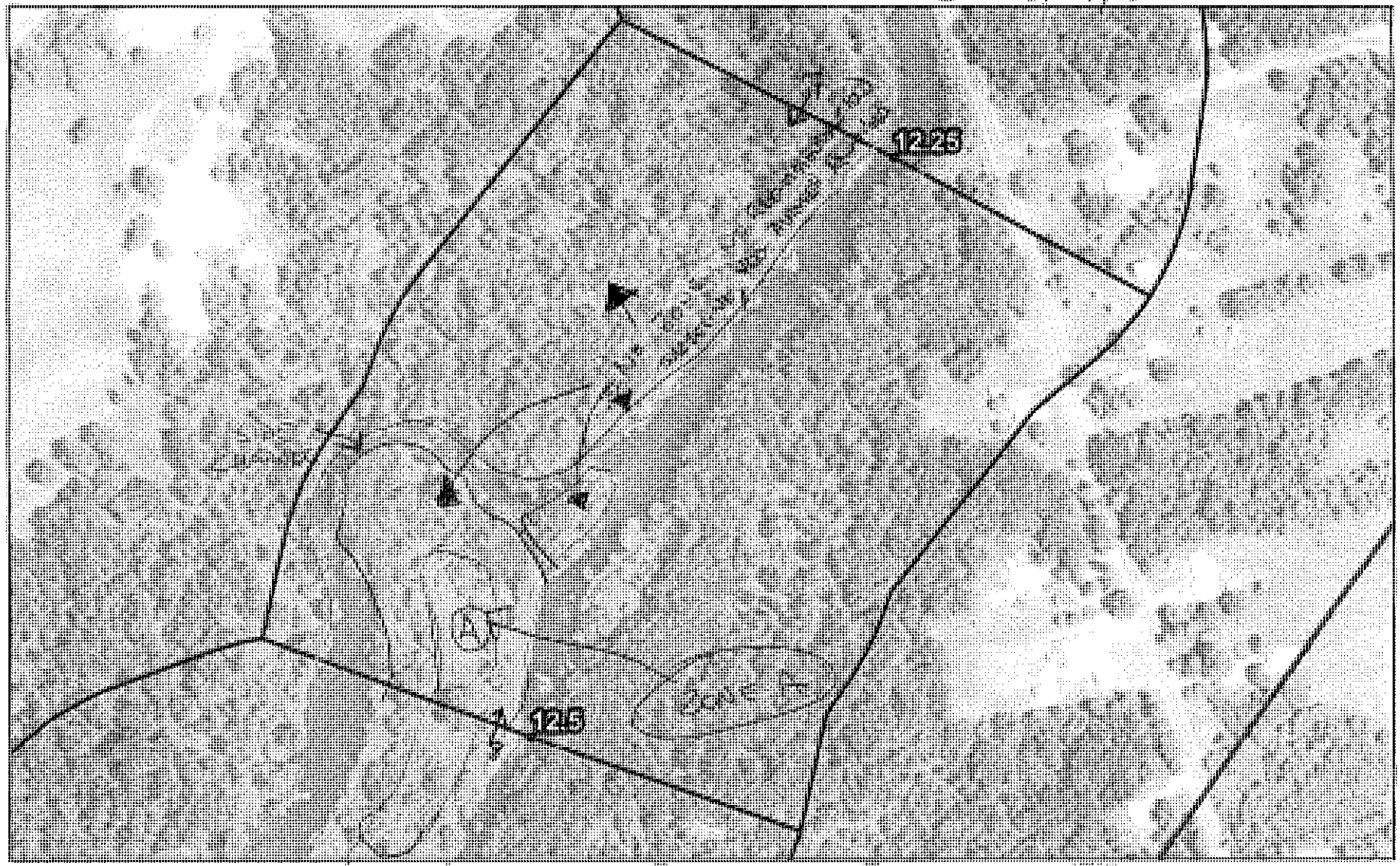
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

SLAT Item 53 8/27/10



12 27 00
$ 4534

SHORELINE CLEANUP PLAN - SEGMENT SCC1
CONFLUENCE OF TALMADGE CREEK TO CERESCO DAM

Division C: Mile Marker 12.25 - 12.5 Right Bank while looking downstream

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/11/10 Time: AM / PM 9:50

Operations Division: C Segment ID: From 12.25 Start MP to End MP 12.50 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Jeff Reynolds

Division Supervisor(Contractor): Pablo Gardenas

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT items inspected & complete

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each Item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT items inspected & complete

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT items inspected & complete

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT items inspected & complete.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 09/11/10 Time: AM / PM 1330

Operations Division: C Segment ID: From 12.25 Start MP to End MP 12.5 Segment Length: 0.25 mile

Bank: (LDB / RDB) ☑ Island

Weather: Sun/Cloud/Rain/Snow/ Rain

Field Inspection Team

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): Philip Gammon

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work complete.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill											
OPERATIONS CLEANUP RECOMMENDATIONS											
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 12.25-12.5 Left Bank While Looking Downstream											
EPA-C-0322	Shoreline	SCAT T2 8/28/2010	mousse along debris in water veg had been trimmed in this area. Overall Good. oil on mud-no recommendations. Submerged pompoms 50' upstream of MP 12.75. photo 513 shows mousse, oiled debris; photo 512 is looking downstream. see comments in zone A					Boom should be moved off shore.	42.30403	-85.14836	Y / N
SCC4-10	Shoreline	Shoreline Assessment	●	●		●	Logjam. Small amt of pooled oil, use hand snare. Remove oil debris. High volume flush.		42.30473	-85.14947	Y / N
SCC4-12	Shoreline	Shoreline Assessment	●		●	●	High impact grass flat. Deploy from C4 flush and deflects to existing skim ops.		42.30357	-85.14933	Y / N

Printed Team Members Name: Bill Bates, Kenneth Mroczkowski, Amanda Bohnenblust

Date: 9/13/10 Team 1

Comments:

still sheening near marker SCC4-12

SCC4-10 is on island

-21 (8/18) Pooled oil in wetland, should be removed 42.305 -85.146 Y / N

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 12.25-12.5 Right Bank While Looking Downstream											
EPA-C-0071	Shoreline	SCAT T1 8/18/2010	forested wetland with staining/coating of surface oil residue					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30367	-85.14930	Y / N

Printed Team Members Name: Bill Bates, Kenneth Mroczkowski Amanda Bohnendl

Date: 9/13/10 Team 1

Comments:

EPA-C-0071 is on island not rdb

walked near 20-21: Any was not identified and point is not a recommendation for, no pooled present

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 12.25-12.5 Island											
EPA-C-0070	Shoreline & Overbank	SCAT T1 8/17/2010					Vegetation on island impacted	Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30328	-85.14948	Y/N

Printed Team Members Name: Bill Bates, Kenneth Mroczkowski, Amanda Schmeltz

Date: 9/13/10 Team 1

Comments:

Sorbant pads is still in water on right side of island

Was not able to identify marker EPA-C-0070, however island looks good

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 12.25 to MP 12.50 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley (date) 12-Sept-2010 Enbridge

Signature Eduardo Rovira (date) 9/12/10 EPA

Eduardo Rovira

4. **SCAT Reassessment**

Signature (date) 9/13/10 Enbridge

Amanda Bonnenblust

Signature WILLIAM PATES (date) 9/13/10 EPA

Signature (date) 09/13/10 MDNRE

Kenneth M. Mraczkowski

5. **EPA**

Signature (date) 9.18.10 EPA Division Supervisor

JASON MUSANTE

SCC-4-12: oil exuding from cut-bank. Hotshot notified and area boomed off. Refer to OSM for specific strategy. JM

Appendix E
Photographs



Photo 0339 – Looking southwest at right descending bank.



Photo 0340 – Looking west at right descending bank.

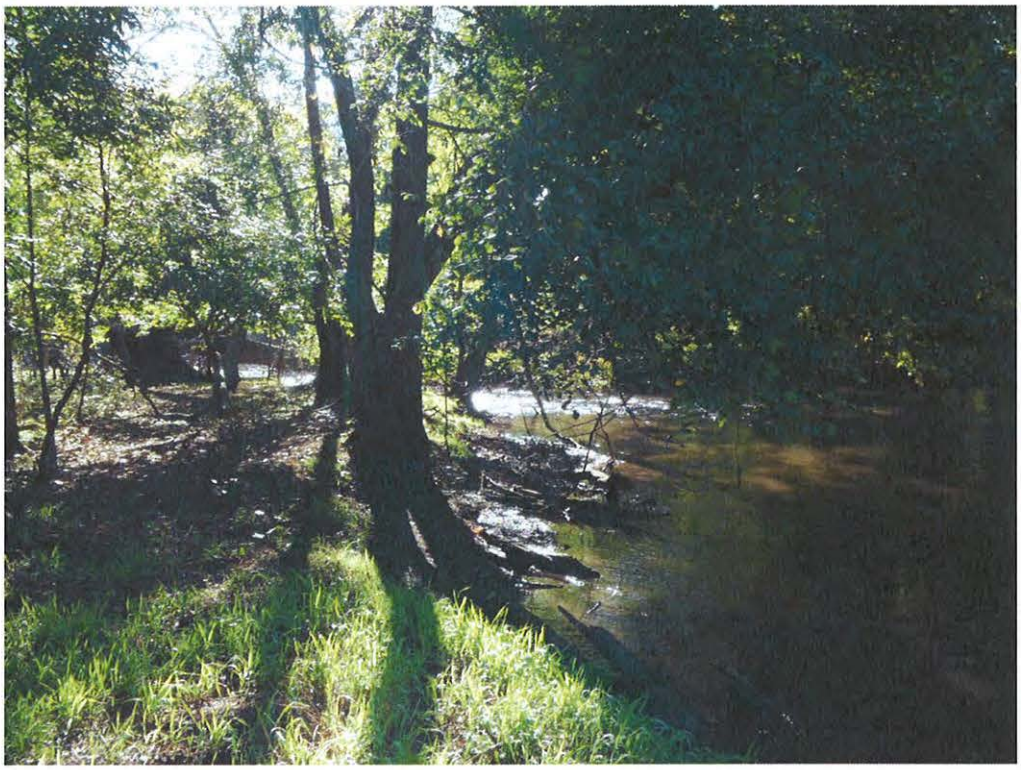


Photo 0341 – Looking southeast at right descending bank. Near SCC4-13.



Photo 0342 – Looking north at island.

Field Photo Log – Segment MP 12.50

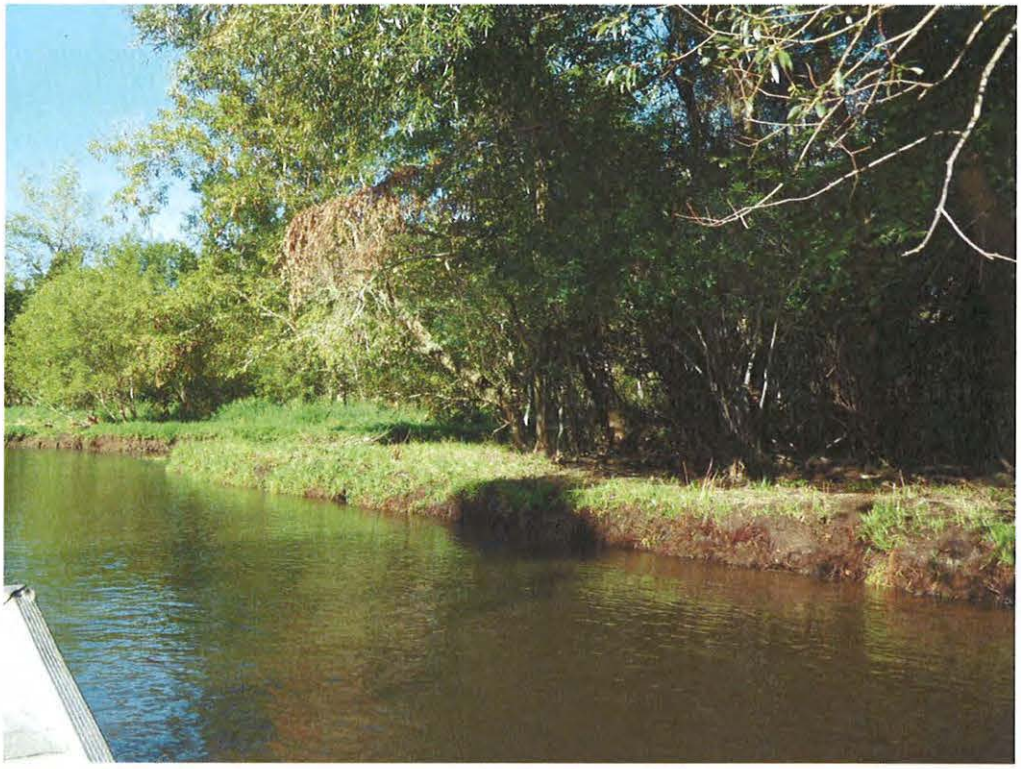


Photo 0343 – Looking east at island.



Photo 0344 – Looking northeast at island. Near SCC4-10.

Field Photo Log – Segment MP 12.50



Photo 0345 – Looking southwest at island. Near EPA-C-0071.



Photo 0346 – Looking northeast at island. Near EPA-C-0070.



Photo 0353 – Looking northeast at left descending bank.

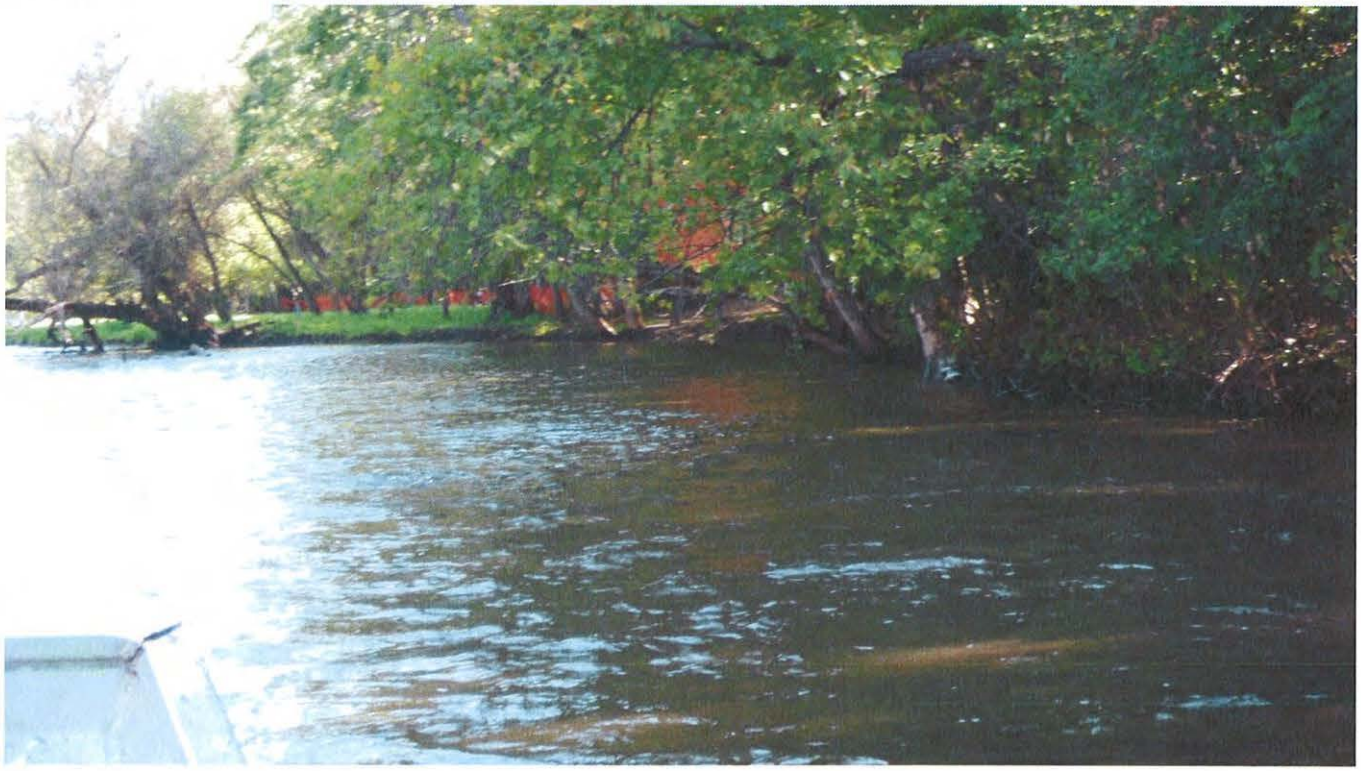


Photo 0354 – Looking north at left descending bank.

Field Photo Log – Segment MP 12.50

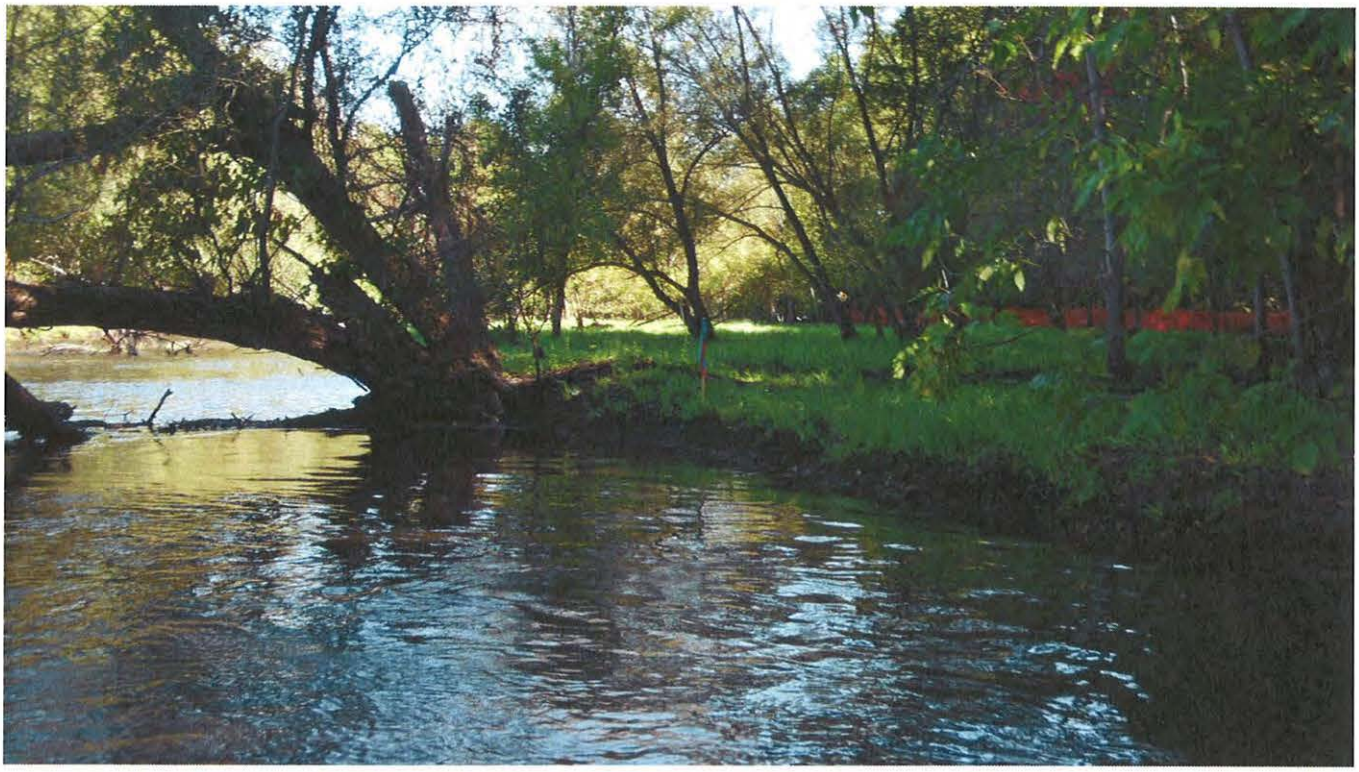


Photo 0355 – Looking northeast at left descending bank. Near SCC4-12.

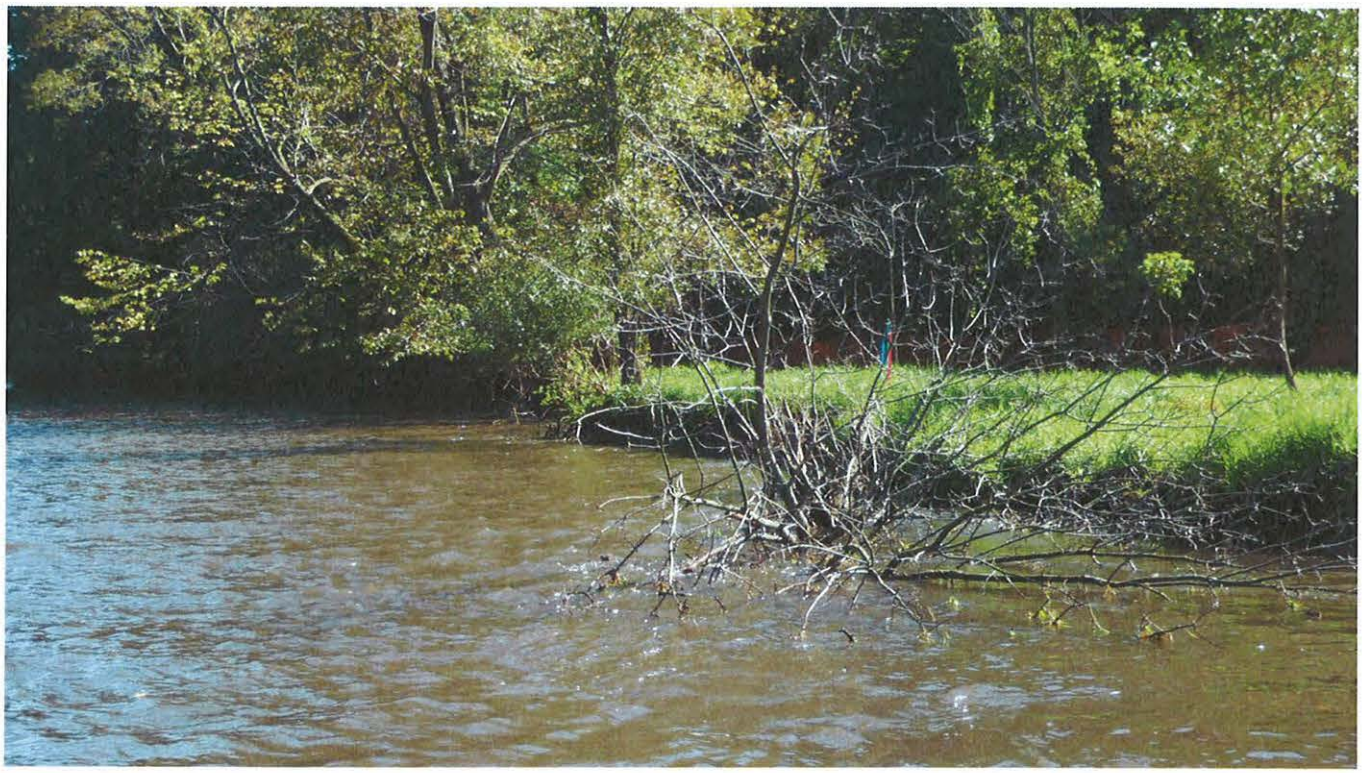


Photo 0356 – Looking northeast at left descending bank. Near EPA-C-0322.

Field Photo Log – Segment MP 12.50

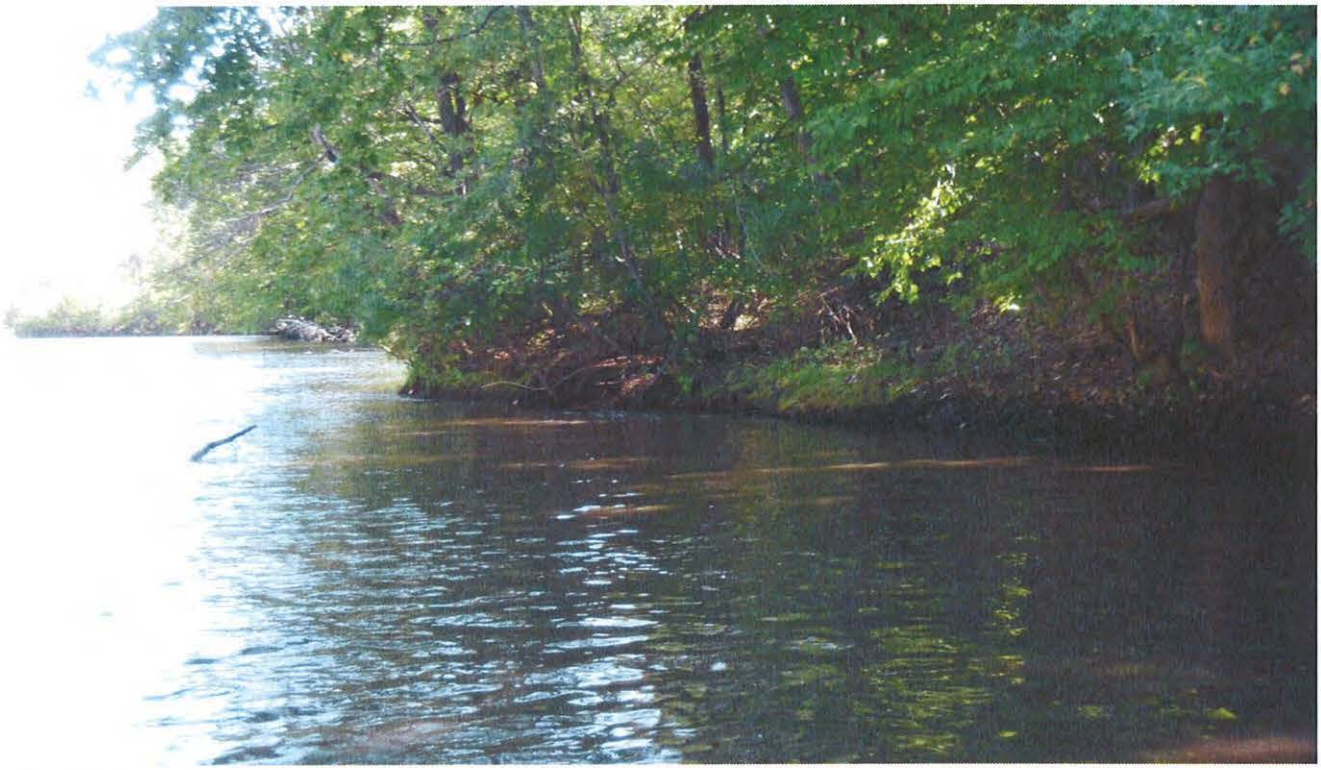


Photo 0357 – Looking northeast at left descending bank.

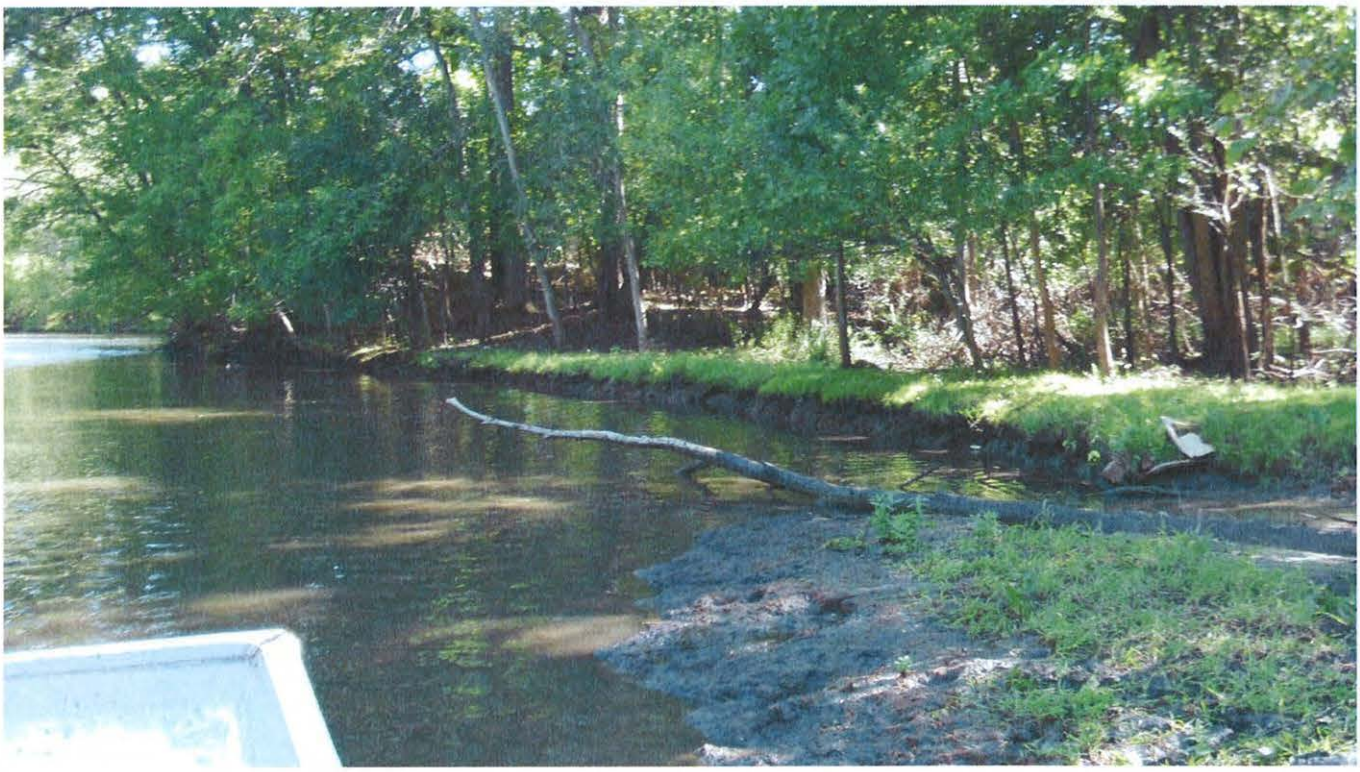


Photo 0358 – Looking northeast at left descending bank. Near PO-21-Zone.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Response Completion Report
Kalamazoo River Segment 12.75 – MP 12.50 to 12.75

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the response completion report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 12.75 had moderate oiling on the left descending bank including oiled vegetation along the bank and moderate oiling on the right descending bank including buildup of oil mousse on vegetation. Oiling of the right descending overbank was observed. Islands were present with oiled vegetation observed. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 12.75 consisted of the following.

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris
- Removal of overhanging limbs

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled trees along the left descending bank near MP 12.25 and EPA-C-0326
- Oiled woody vegetation on the right descending bank near MP 12.50 and MP 12.75 and on interior of island
- Oiled debris along west side of island near MP 12.50

Segment 12.75 has reached the operational endpoints pursuant to EPA's Clean Water Act. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, inciplent asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

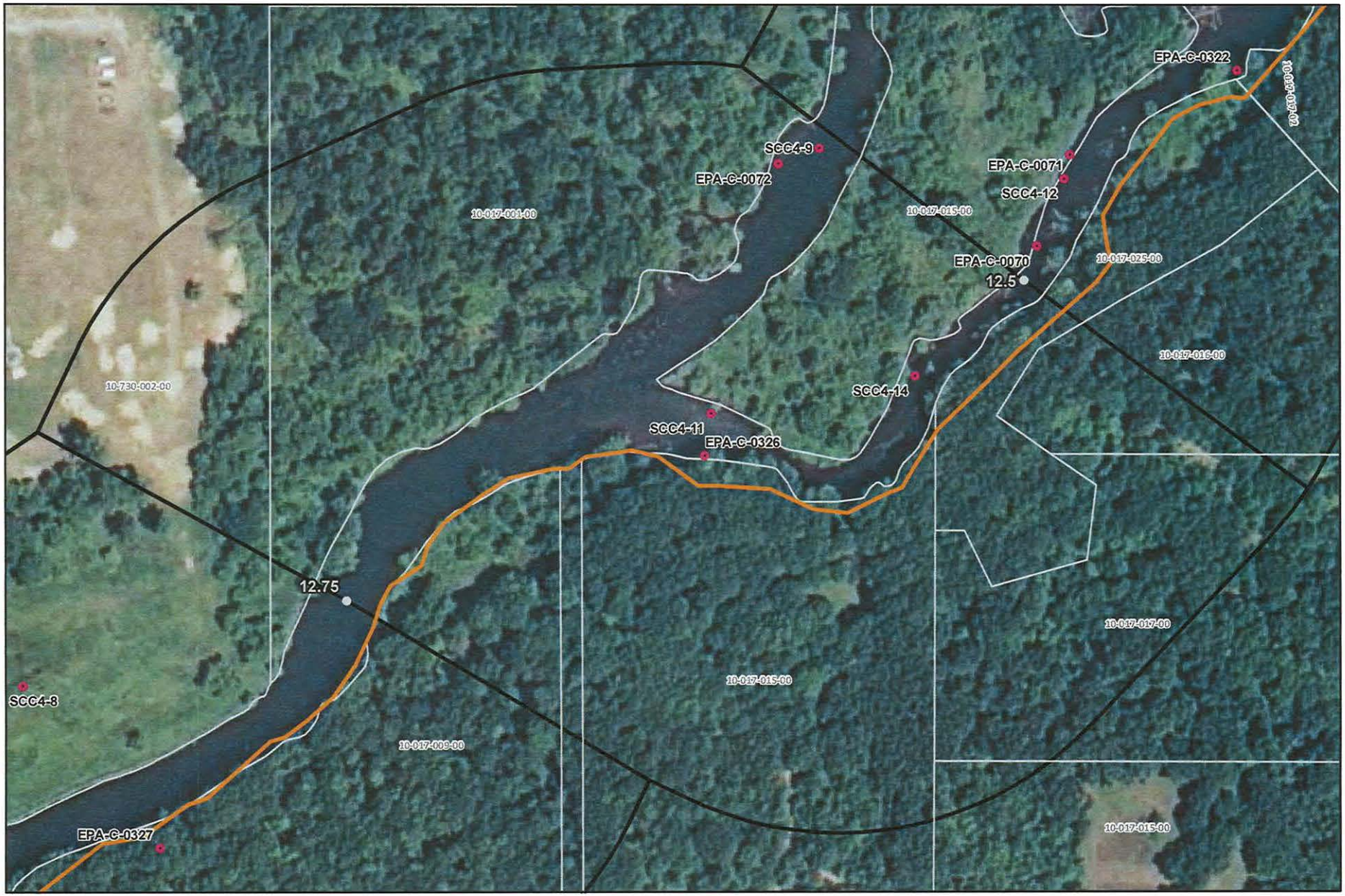
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 12.5-12.75 Left Bank While Looking Downstream										
EPA-C-0326	Shoreline	SCAT T2 8/28/2010	sheen from snag Same location as GPS waypoint; over bank some mousse on snags-PPE left on shore. Sheen on water; woody debris, boom on shore 100 feet upstream of C4 staging area, stranded pompom 25 feet downstream of C4. photo 515 is looking downstream. overall cleanup looked good					Boom prior to treatment.	42.30239	-85.15135
SCC4-9	Shoreline	Shoreline Assessment	?		●	●	Oiled grass along bank.		42.30368	-85.15072
SCC4-11	Shoreline	Shoreline Assessment	●		●	●	Small island. High volume flush. Set up boom and snare.		42.30257	-85.15132





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 12.5-12.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

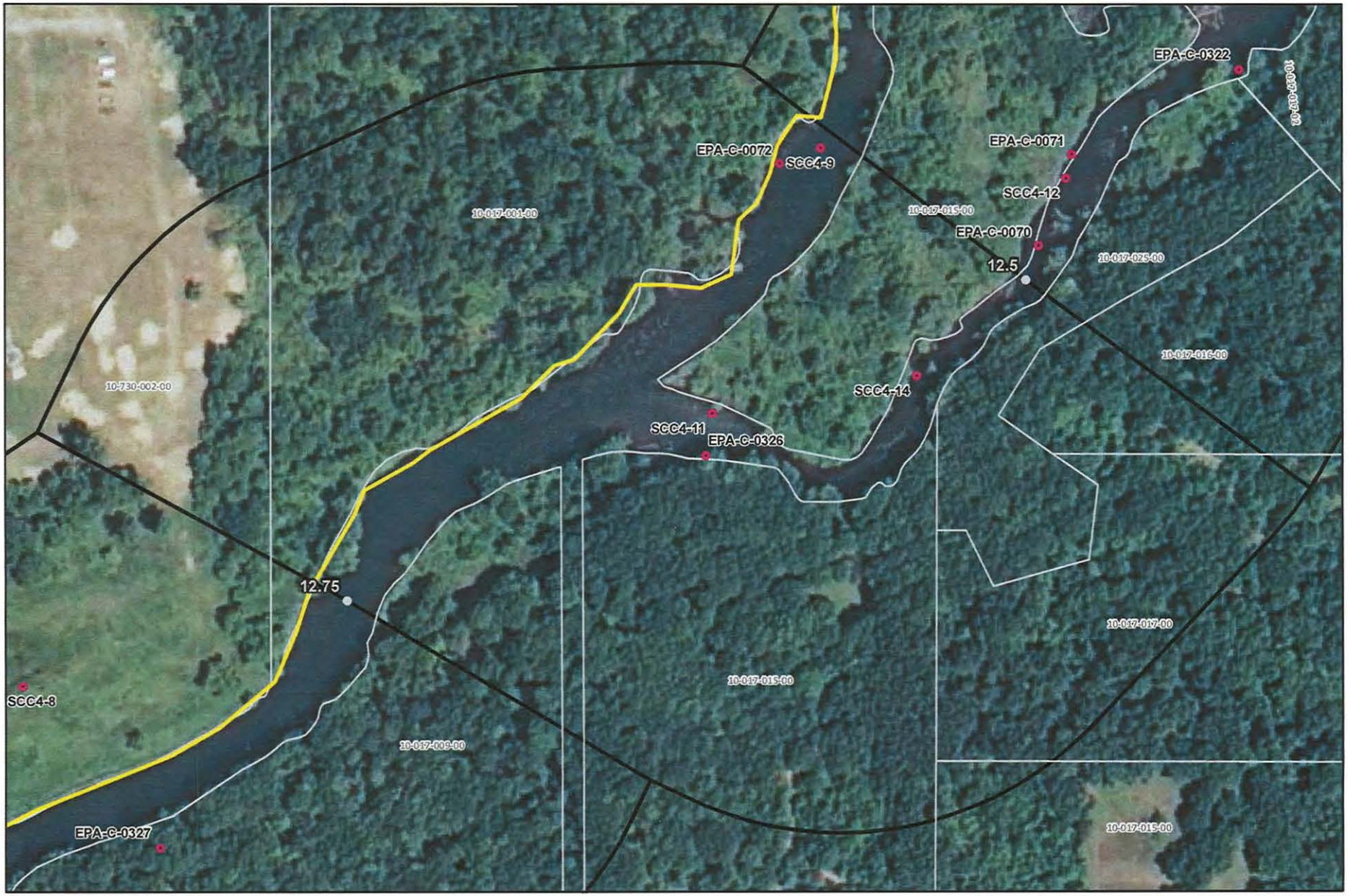
ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 12.5-12.75 Right Bank While Looking Downstream										
EPA-C-0072	Shoreline & Overbank	SCAT T1 8/18/2010	Mousse being trapped by aquitic grasses. Mousse is thick and building up on grasses.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30362	-85.15095
SCC4-14	Shoreline	Shoreline Assessment	•		•	•	Flood Plain oiling heavy back 8 meters. Current fast. Brush cut chainsaw.		42.30273	-85.15017





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 12.5-12.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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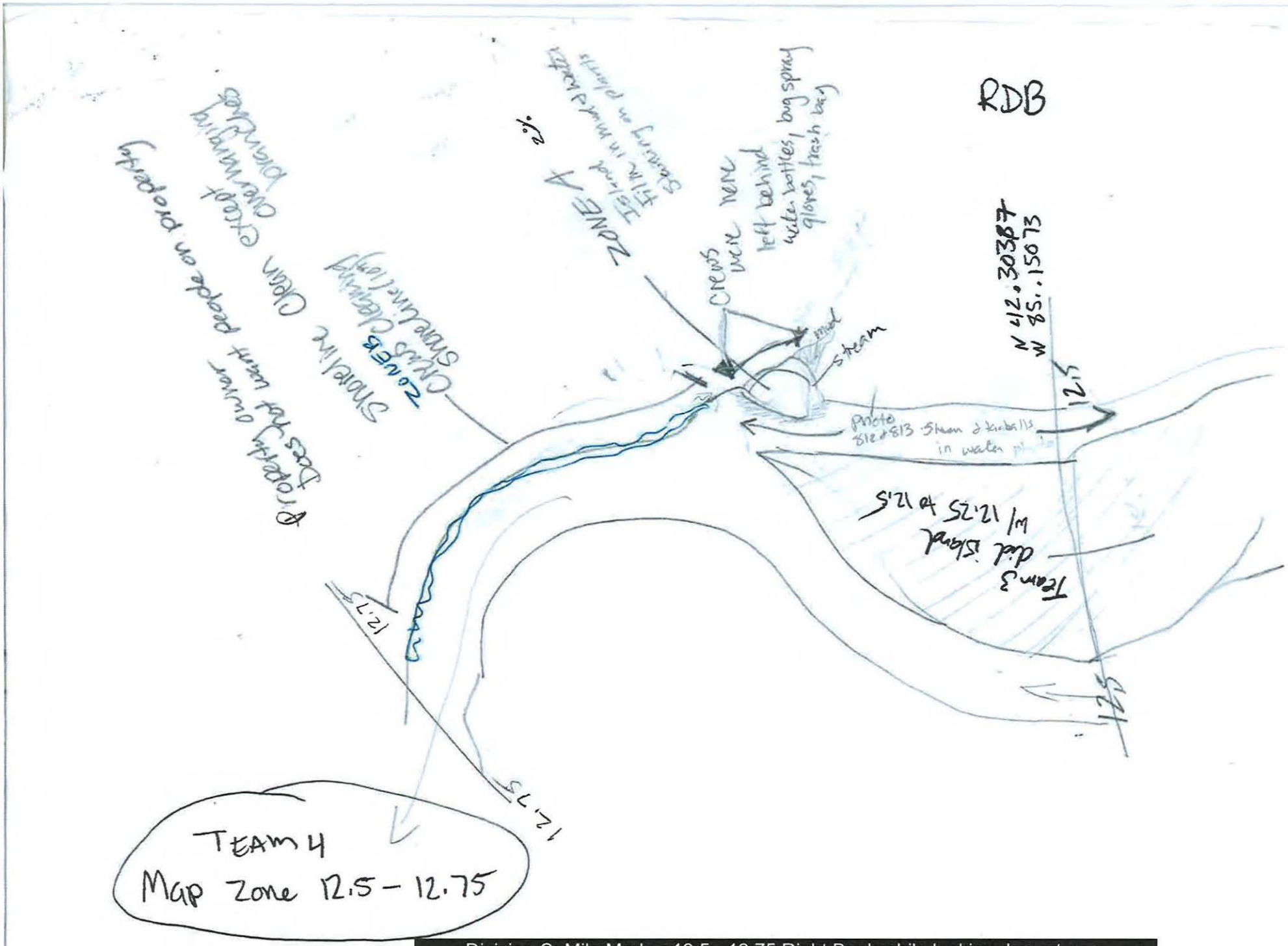
Coordinate System: NAD 1983 State Plane Michigan South Feet



Division C: Mile Marker 12.5 - 12.75 Right Bank while looking downstream

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/11/10 **Time:** (AM) / PM 10:45

Operations Division: C **Segment ID: From** 12.50 **Start MP to End MP** 12.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Jeff Reynolds

Division Supervisor(Contractor): PHILIP GARDNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected & completed

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected & complete

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected & complete.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected & complete

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 091110 Time: AM / PM 1445

Operations Division: C Segment ID: From 125 Start MP to End MP 12.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island

Weather: Sun/Cloud/Rain/Snow/ Rain

Field Inspection Team

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): PHILIP GARRISON

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work complete.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 12.5-12.75 Left Bank While Looking Downstream											
EPA-C-0326	Shoreline	SCAT T2 8/28/2010	sheen from snag Same location as GPS waypoint; over bank some mousse on snags-PPE left on shore. Sheen on water; woody debris, boom on shore 100 feet upstream of C4 staging area, stranded pompom 25 feet downstream of C4. photo 515 is looking downstream. overall cleanup looked good					Boom prior to treatment.	42.30239	-85.15135	(Y) / N
SCC4-9	Shoreline	Shoreline Assessment	?		•	•	Oiled grass along bank.		42.30368	-85.15072	(Y) N
SCC4-11	Shoreline	Shoreline Assessment	•		•	•	Small island. High volume flush. Set up boom and snare.		42.30257	-85.15132	Y N

Printed Team Members Name:

Date:

Comments: → small piles of cut, oiled, woody debris

Team 1 9/13/10

Amanda Bohnenblust

Kenneth M. Mraczkowski

Bill Bates

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 12.5-12.75 Right Bank While Looking Downstream											
EPA-C-0072	Shoreline & Overbank	SCAT T1 8/18/2010	Mousse being trapped by aquitic grasses. Mousse is thick and building up on grasses.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30362	-85.15095	(Y) / N
SCC4-14	Shoreline	Shoreline Assessment	•		•	•	Flood Plain oiling heavy back 8 meters. Current fast. Brush cut chainsaw.		42.30273	-85.15017	(Y) / N

Printed Team Members Name:
Date:
Comments: ↳ actually on to island

Team 1 9/13/10
Amanda Behrendbst
Kenneth M. Mroczkowski
Bill Bates

PO-0003 (8/16) Pooled oil, remove pooled oil 42.303 -85.152 (Y)

Floodplain delineation area per floodplain data (See Attached Map)
42.30300
-85.15100

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 12.50 to MP 12.75 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Karl Costley 12-Sept-2010 (date) Enbridge

Signature Eduardo Ronca 9/12/10 (date) EPA

4. **SCAT Reassessment**

Signature Amanda Bohnenblust 9/13/10 (date) Enbridge

Signature William J Bates 9/13/10 (date) EPA

Signature Kenneth M. Mroczkowski 09/13/10 (date) MDNRE

5. **EPA**

Signature JASON MUSANTE 9.19.10 (date) EPA Division Supervisor

Appendix E
Photographs

Field Photo Log – Segment MP 12.75



Photo 0350 – Looking southeast at island. Near SCC4-11.



Photo 0351 – Looking southwest at right descending bank.

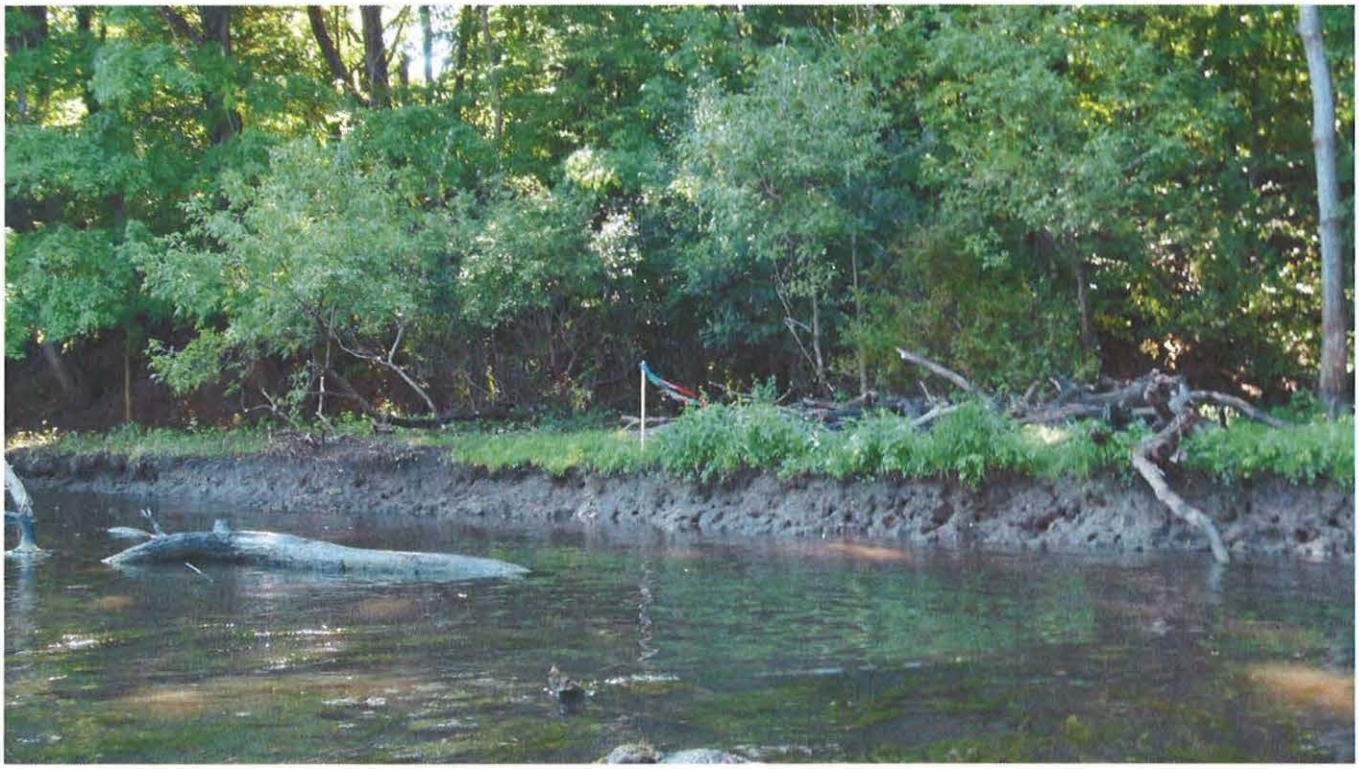


Photo 0352 – Looking southeast at left descending bank. Near EPA-C-0326.



Photo 0353 – Looking northeast at left descending bank.

Field Photo Log – Segment MP 12.75



Photo 0347 – Looking west at left descending bank. Near EPA-C-0072 & SCC4-9.



Photo 0348 – Looking northeast at island. Near SCC4-14.

Field Photo Log – Segment MP 12.75

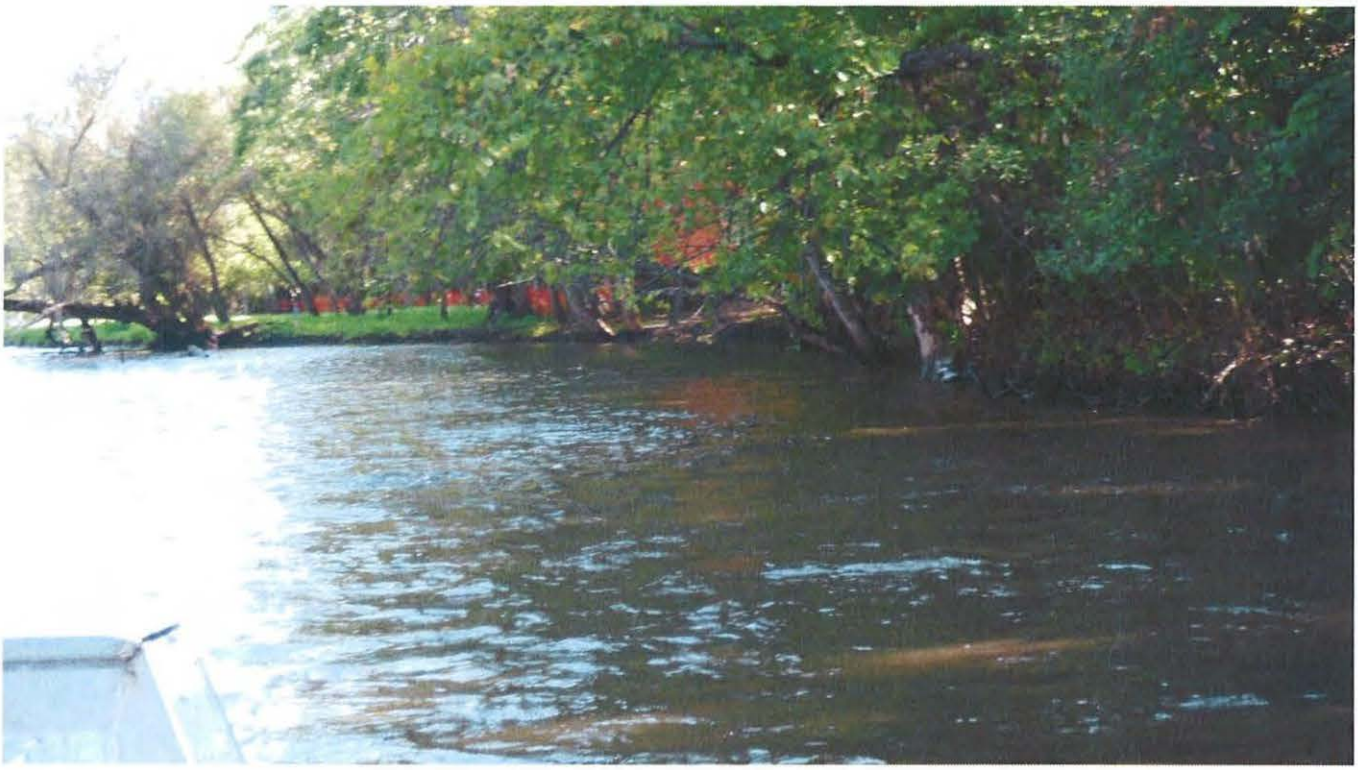


Photo 0354 – Looking northeast at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 13.00 – MP 12.75 to 13.00

Enbridge Energy

September 18, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 13.00 had moderate oiling, oiled vegetation and oiled debris on the left descending bank. No islands were present within this river segment. Light oiling was observed on the right descending bank. The overbank contained multiple areas with oil on the floodplain on the right descending bank. The areas included Zones A-E and Zones H-K (Note: Zones F & G in Segment 13.25).

Actions

The shoreline clean-up activities within Segment 13.00 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs;
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads;
- Removal of oiled debris.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along almost the entire left descending bank from MP 12.75 to MP 13.00 and along right descending bank near MP 13.00;
- Oiled woody vegetation along entire left descending bank, on left descending overbank and along right descending bank near MP 13.00 and MP 12.75.

Segment 13.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 12.75-13
Left Bank While Looking Downstream

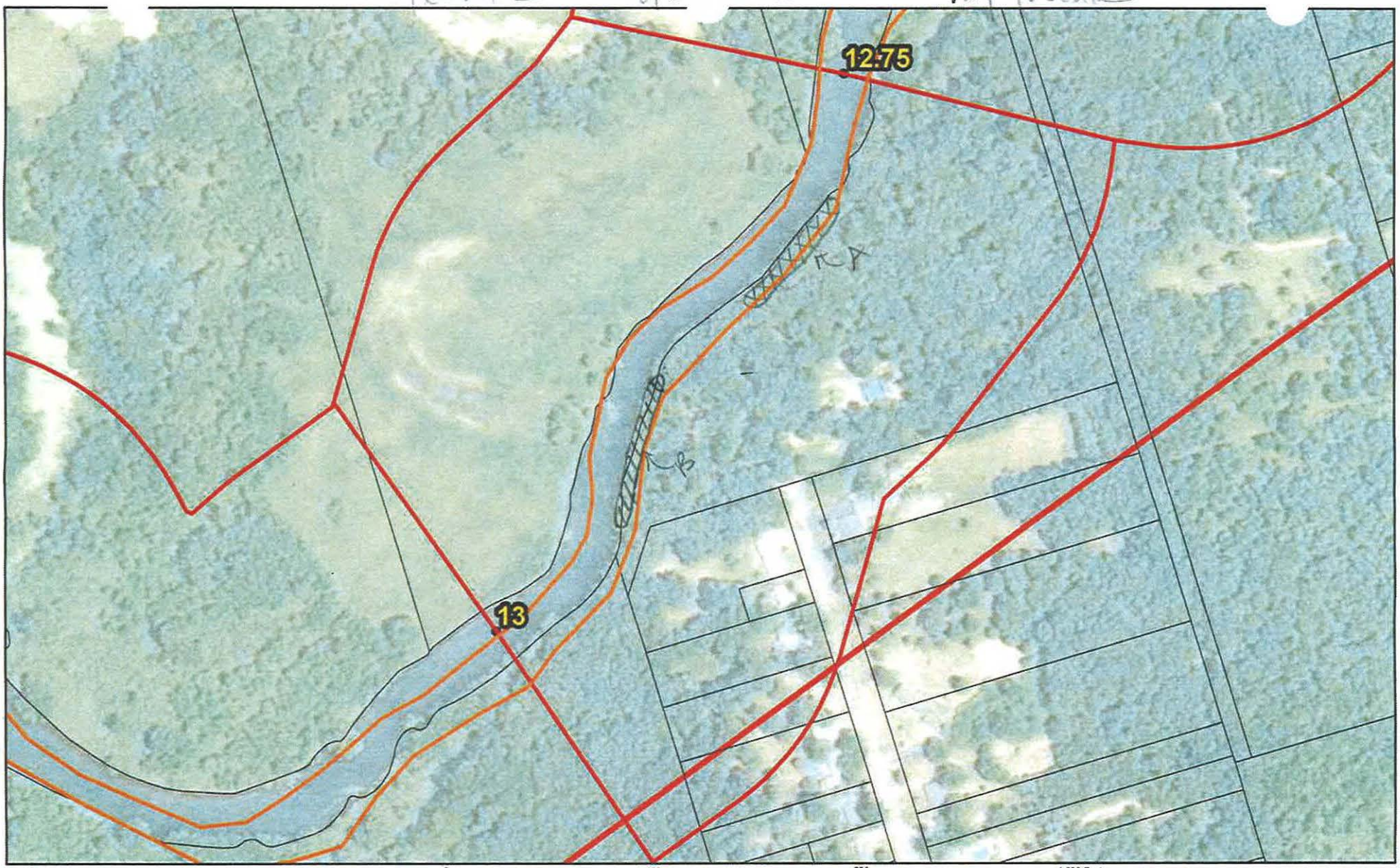
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuartermileMarkers
Parcels_1020ftBuffer
Shoreline
River_QuarterMiles
Divisions

12.75 to 13.0

Image: 2009 NAIP

SHEET # 48

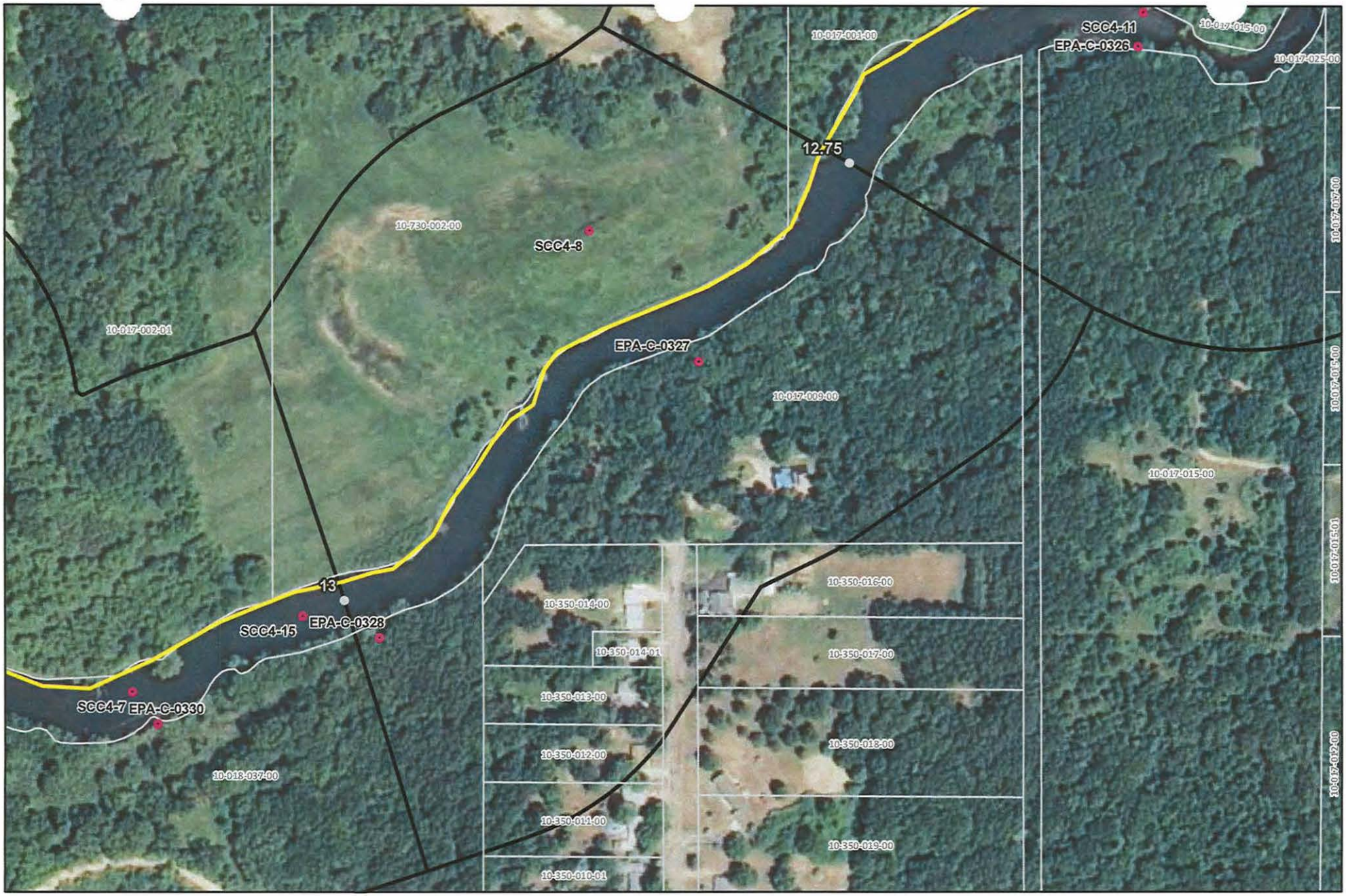
ENTRIX
Down to Earth. Down to Business™
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Division C: Mile Marker 12.75 - 13 Left Bank while looking downstream

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 12.75-13 Right Bank While Looking Downstream										
No Operational Focus Areas identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 12.75-13
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/15/10 **Time: AM / PM**

Operations Division: _____ **Segment ID: From** 12.15 **Start MP to End MP** 13.00 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Matt Bradson MATT BOBDSON

Division Supervisor(Contractor): PHILIP GARDNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

All SCAT ITEMS inspected + cleared

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

All SCAT ITEMS INSPECTED + CLEARED

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

All SCAT ITEMS INSPECTED + CLEARED

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

All SCAT ITEMS INSPECTED + CLEARED

13.0

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 091510 **Time: AM / PM**

Operations Division: C **Segment ID: From** 12.75 **Start MP to End MP** 13.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Chad Vice

Division Supervisor(Contractor): Art Slyton

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 12.75-13 Left Bank While Looking Downstream										
EPA-C-0327	Shoreline	SCAT T2 08/28/2010	photo 517 is looking downstream from milepost 12.75. overall cleanup efforts looked good					Manual removal (scraping or wiping with sorbents on oil < 0.1 cm)	42.30073	-85.15441
EPA-C-0328	Shoreline	SCAT T2 08/28/2010	300ft upstream MP/ 3.0 shows sheen where current is slow; throughout 1/4 mile and and approx 200 feet upstream of MP 13.0 mousse building up at snags, oiled debris on snags (see photos 520 and 521). workers were cutting overhanging vegetation in the area. overall cleanup efforts looked good					Boom prior to treatment	42.29928	-85.15663
SCC4-8	Shoreline	Shoreline Assessment	•		•		Oil on floodplain approx. 1600 ft onto private property. Property owner has equipment on site. Sod removal.		42.30140	-85.15518

Team 2 — 15-KDG — 1-17-2010

Enbridge Pipeline Release Inc. — t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 12.75-13 Right Bank While Looking Downstream											
No Operational Focus Areas identified.											
SCC4-8 Shoreline SCAT T2 (8/28) Flushing needed and vegetation removal, Oil in floodplain, approx 1600ft onto private property, owne has equipment on site 42.30140 -85.15518 (Y) / N											
(A)	field				X	X	230 x 5ft 20% coverage ST/SR	wp5 Start 42.30125 -85.15559	42. 30092	85. 15638	
(B)	field				X	X	280 x 6 20% coverage ST/SR	wp6 -Start N42.30167 W85.15572 End wp8	42. 30139	85. 15684	
(C)	field				X	X	3 x 56ft 40% Coverage ST/SR		42. 30154	85. 15577	
(D)	field				X	X	140 x 5ft ST/SR 20%	wp10 (North side) 42.30104 85.15718	wp11 (South side) 42. 30067	85. 15682	
(E)	field				X	X	15 x 15 ST/SR 15%	wp12	42. 30056	85. 15723	
(F)	edge woods						4 x 55 ST/SR 10%	Along treeline wp13	42.30094	85. 15781	
(G)	woods						5ft² 5% ST/SR	Inside wooded area wp14	42. 30074	85. 15801	
(H)	Shoreline						20 x 5 ST/SR 5%	wp15	42. 30074	85. 15637	
(I)	shoreline						@ MP 13.0 2 3x3ft areas 20% ST/SR	wp16	42. 29964	85. 15696	
(J)	Shoreline						3 x 120ft ST/SR 20% behind willow treeline	wp17	42. 29984	85. 15648	
(K)	Shoreline + back						200 x 40ft ST/SR ground trees + grass in shoreline	wp18	42. 30033	85. 15574	

9/14/10 William Bates
Rachel Matthews
Mike Zambetis



Zone F — WP 13 — N. 42. 30094 W. 85. 15781 — 4 ft X 55 ft — 10%

oiled veg along Treeline outside segment on North end

Zone G — WP 14 — N. 42. 30074 W. 85. 15801 — 5% — 5 ft²

small area inside trees oiled veg

Zone H — WP 15 — N. 42. 30034 W. 85. 15637 — 5% oiled veg * — 90 X 5 ft

Zone I — WP 16 @ mp 13.0 — N. 42. 29964 W. 85. 15696 — @ Shoreline — 2 → 3 X 3 ft areas 20%

Z J — WP 17 — N 42. 29984 W 85. 15648 — Behind willow treeline — 3 X 120 ft — 20%

Zone K — WP 18 — N 42. 30033 W 85. 15594 — 30% — Tar area in dead grass + around trees — 200 X 40 ft

Enbridge Pipeline Release Incide... - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 12.75-13 Left Bank While Looking Downstream											
EPA-C-0327	Shoreline	SCAT T2 08/28/2010	photo 517 is looking downstream from milepost 12.75. overall cleanup efforts looked good					Manual removal (scraping or wiping with sorbents on oil < 0.1 cm)	42.30073	-85.15441	(Y) / N
EPA-C-0328	Shoreline	SCAT T2 08/28/2010	300ft upstream MP/ 3.0 shows sheen where current is slow; throughout 1/4 mile and and approx 200 feet upstream of MP 13.0 mousse building up at snags, oiled debris on snags (see photos 520 and 521). workers were cutting overhanging vegetation in the area. overall cleanup efforts looked good					Boom prior to treatment	42.29928	-85.15663	(Y) / N
SCC4-8 OR RDB	Shoreline	Shoreline Assessment	•		•		Oil on floodplain approx. 1600 ft onto private property. Property owner has equipment on site. Sod removal.		42.30140	-85.15518	(Y) / N

Printed Team Members Name: MIKE ZAMBETIS, Rachel Matthews, WILLIAM BATES
Date: 9/14/10
Comments:
NOTE: SCC4-8 INCLUDES ZONES A-E & H-K ON THE RIGHT BANK WHILE LOOKING DOWNSTREAM

SCC4-8 Is on Right bank and should be assessed as such

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 12.75 **to MP** 13.0 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

BLR 14-Sept-10
Signature DOUG DGREN (date) Enbridge

Eugene Dennis 9-14-2010
Signature Eugene Dennis (date) EPA

4. **SCAT Reassessment**

M.C.A. 9/14/10
Signature MICHAEL A. ZAMBETIS (date) Enbridge

9/14/10
Signature WILLIAM J BATES (date) EPA

9-14-2010
Signature Rachel Matthews (date) MDNRE

5. **EPA**

Jason Musante 9.19.10
Signature JASON MUSANTE (date) EPA Division Supervisor

Appendix E
Photographs



Photo 0389 – Looking east at left descending bank, near EPA-C-0328.



Photo 0390 – Looking east at right descending bank (overbank), near SCC4-8.



Photo 0391 – Looking southeast at right descending bank.



Photo 0392 – Looking east at left descending bank, near EPA-C-0327.



Photo 0393 – Looking northeast at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 13.25 – MP 13.0 to 13.25

Enbridge Energy

September 21, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 13.25 had moderate levels of oil staining on the left descending bank. The shoreline of the left descending bank contained moderately oiled grass, oil coated vegetation/debris, and oiled overhanging vegetation and pooled oil. In addition, the overbank contained oil coated vegetation and groundcover. No island was present in the segment. Light levels of oil staining were observed on the right descending bank. A zone of oiled grass near the upstream end and an area of saturated soil was observed along the woodline of the right descending bank.

Actions

The shoreline clean-up activities within Segment 13.25 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Vegetation removal, leaving roots intact and woody plants greater than 2" in diameter;
- Oiled debris removal;
- Replacement of existing boom;
- Ground cover removal through mowing;
- Pooled oil removal

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody and herbaceous vegetation along left descending bank in SCAT assessment zone A.
- Oiled woody vegetation along left descending bank in SCAT assessment zones C, E, and F.
- Oiled herbaceous and woody vegetation, as well as a strong oil smell along left descending bank in SCAT assessment zone F.
- Oiled soil and sheen originating from bank along left descending bank near SCAT assessment zone F.
- Oiled woody and herbaceous vegetation in zone along upstream end of right descending bank.
- Oily debris pile and oiled woody vegetation along right descending bank.

Segment 13.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

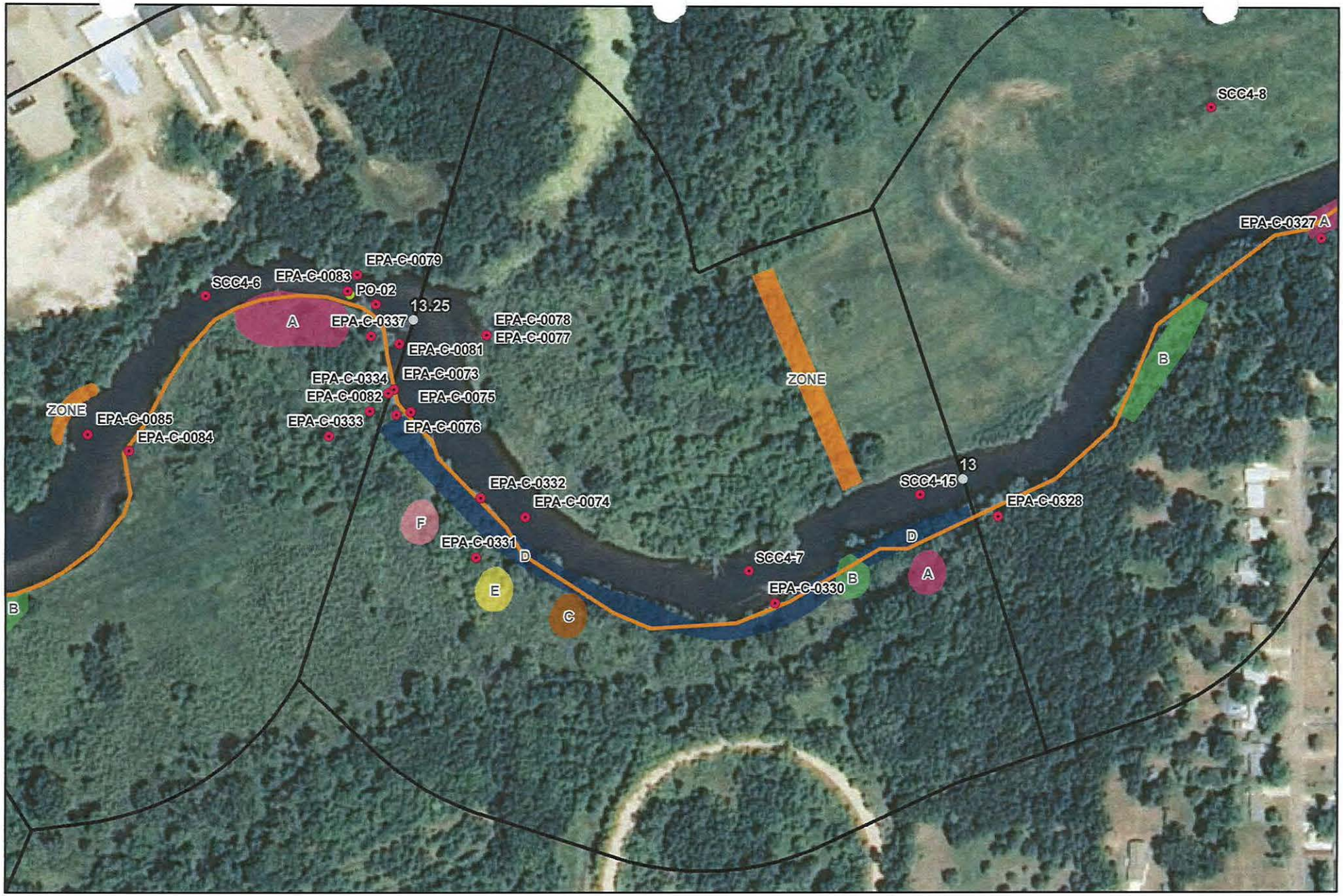
- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

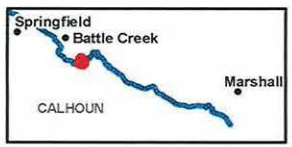
- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 13-13.25 Left Bank While Looking Downstream										
EPA-C-0330	Shoreline	SCAT T2 08/28/2010	Throughout 1/4 mile isolated small <2x2 patches of oil coat/cover. snag is@gps point shoreline from snag down has overhanging oiled Veg. photo 525 shows oiled debris on snag in zone B. photo 526 shows oiled ooverhanging veg in zone B					Natural attenuation recommended	42.29882	-85.15817
EPA-C-0331	Overbank	SCAT T2 08/28/2010	Throughout 1/4 mile isolated small <2x2 patches of oil coat/cover. spotty patches of oiled veg throughout zone; photo 527					Natural attenuation recommended	42.29904	-85.16024
EPA-C-0332	Overbank	SCAT T2 08/28/2010	Throughout 1/4 mile isolated small <2x2 patches of oil coat/cover. workers have mowed, 10 feet from shore. Beyond 10' throughout the quarter mile the next Ten feet in has spotty oiled veg which should be removed. photo 528					Natural attenuation recommended	42.29934	-85.16021
EPA-C-0073	Not Provided	SCAT T1 8/14/1021						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29990	-85.16082
EPA-C-0074	Main Channel	SCAT T1 8/14/1022	WP75 - boom needs replacing					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29925	-85.15990
EPA-C-0075	Main Channel	SCAT T1 8/14/1023	WP-76 15:34 - pooled oil in upland need boom in this location to catch oil					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29978	-85.16070
EPA-C-0076	Not Provided	SCAT T1 8/17/1040						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29977	-85.16080
SCC4-7 .	Shoreline	Shoreline Assessment	?		•	•	Replace sorbent add snare line anchor mid river and collect tarballs. Marsh flat. Moderately oiled grasses.		42.29898	-85.15835





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B B/C C D E F G H NO OIL ZONE

Division C: Mile Marker 13-13.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

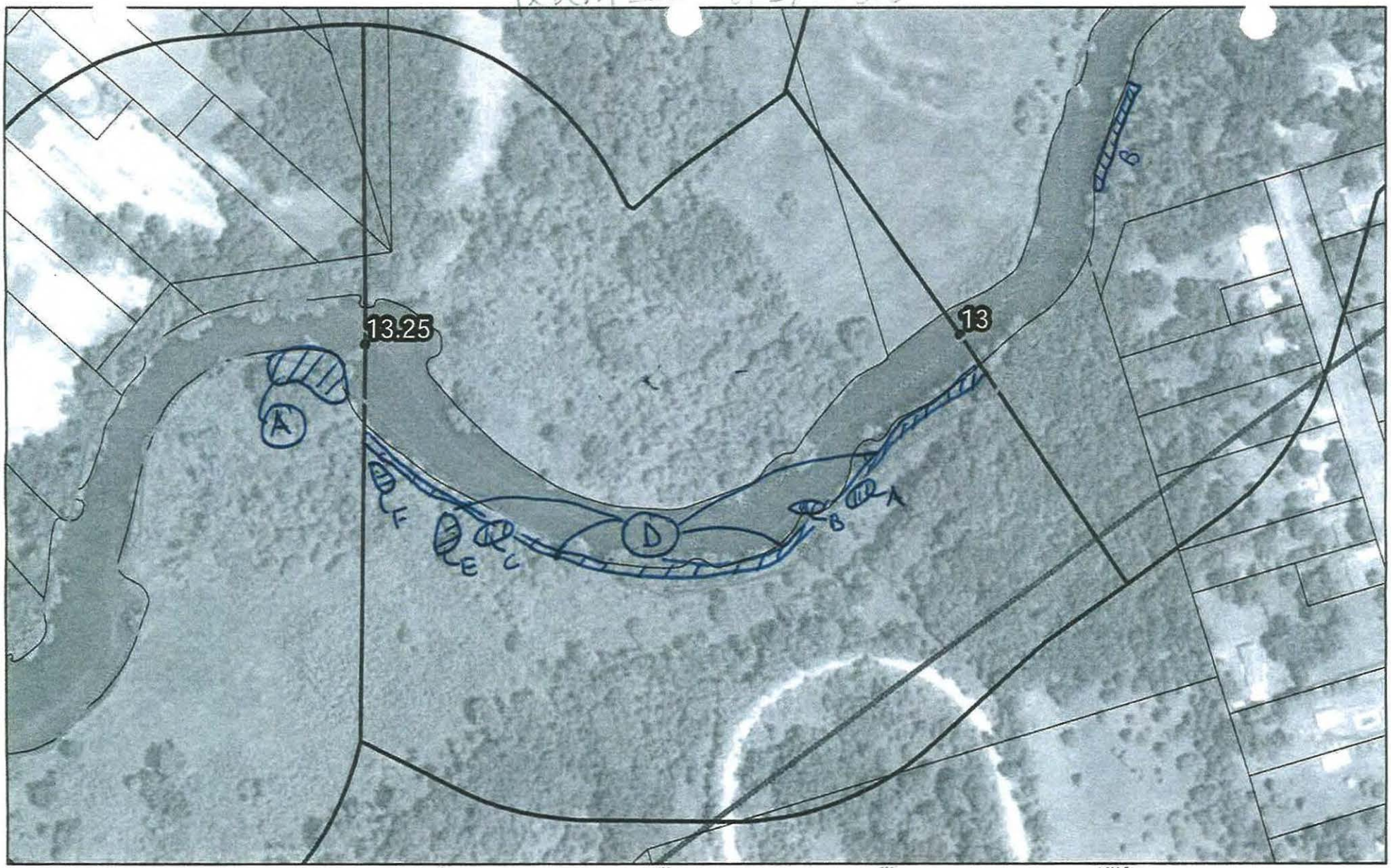
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

team 2 01-21-010



QuartermileMarkers
Parcels_102008Buffer
Shoreline
River_QuarterMiles
Divisions

13.0 to 13.25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image 2009 NAIP

SHEET # 48

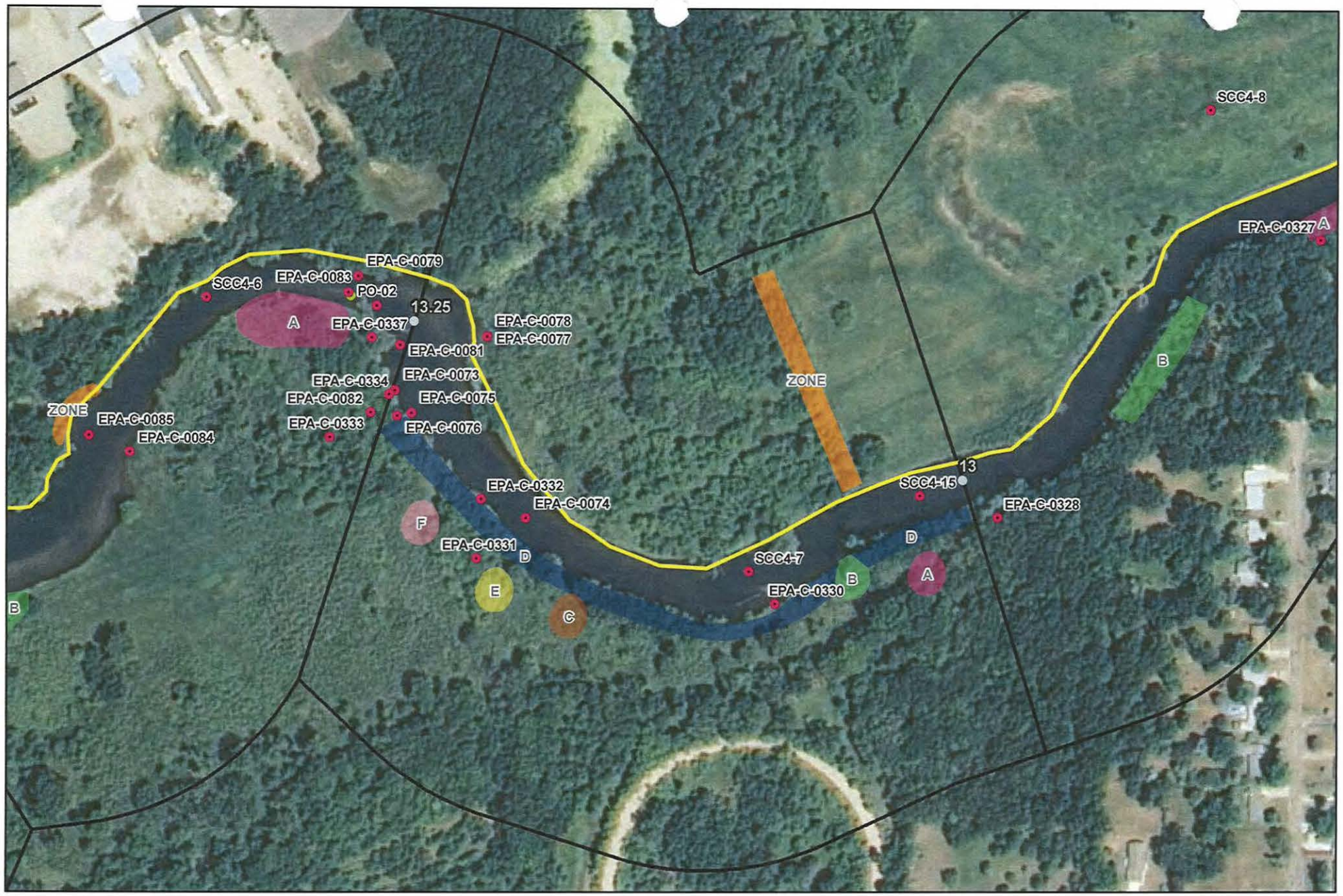
ENTRIX
Down to Earth, Down to Business

www.entrix.com

Coordinate System: [illegible]D 1983 STATE PLANE MICHI[illegible]TH FEET

OPERATIONS CLEA..UP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 13-13.25 Right Bank While Looking Downstream										
EPA-C-0077	Main Channel	SCAT T1 8/18/1051						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30018	-85.16018
EPA-C-0078	Not Provided	SCAT T1 8/18/1052						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30018	-85.16018
SCC4-15	Shoreline	Shoreline Assessment	•		•	•	High volume flush. Grass flat snare boom and sorbent.		42.29938	-85.15717





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 13-13.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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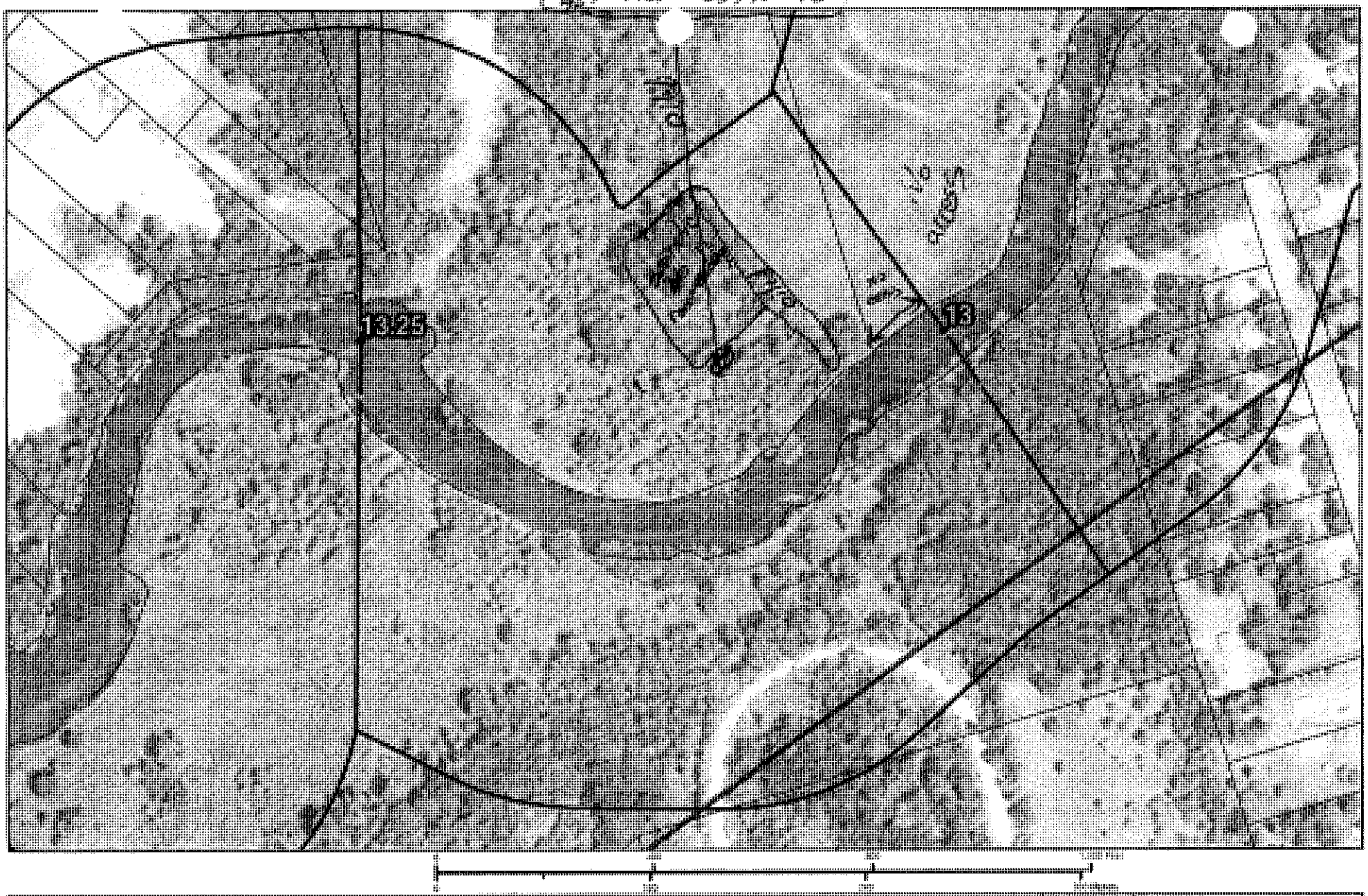
Coordinate System: NAD 1983 State Plane Michigan South Feet



13.0 to 13.25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

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Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/12/10 Time: AM / PM

Operations Division: C Segment ID: From 13.00 Start MP to End MP 13.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Jeff Reynolds

Division Supervisor(Contractor): Art Slyton

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points verified & accepted.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points verified & accepted.

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points verified & accepted.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points verified & accepted.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 091210 **Time: AM / PM**

Operations Division: C **Segment ID: From** 13 **Start MP to End MP** 13.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

EPA Inspector: Chad Vice

Enbridge Inspector:

Division Supervisor(Contractor): Art Slayton

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 13-13.25 Left Bank While Looking Downstream											
SCC4-7	Shoreline	Shoreline Assessment	?		•	•	Replace sorbent add snare line anchor mid river and collect tarballs. Marsh flat. Moderately oiled grasses.		42.29898	-85.15835	(Y) / N
EPA-C-0330	Shoreline	SCAT T2 08/28/2010	Throughout 1/4 mile isolated small <2x2 patches of oil coat/cover. snag is@gps point shoreline from snag down has overhanging oiled Veg. photo 525 shows oiled debris on snag in zone B. photo 526 shows oiled ooverhanging veg in zone B					Natural attenuation recommended	42.29882	-85.15817	(Y) / N
EPA-C-0331	Overbank	SCAT T2 08/28/2010	Throughout 1/4 mile isolated small <2x2 patches of oil coat/cover. spotty patches of oiled veg throughout zone; photo 527					Natural attenuation recommended	42.29904	-85.16024	(Y) / N
EPA-C-0332	Overbank	SCAT T2 08/28/2010	Throughout 1/4 mile isolated small <2x2 patches of oil coat/cover. workers have mowed, 10 feet from shore. Beyond 10' throughout the quarter mile the next Ten feet in has spotty oiled veg which should be removed. photo 528					Natural attenuation recommended	42.29934	-85.16021	(Y) / N
EPA-C-0073	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29990	-85.16082	(Y) N
EPA-C-0074	Main Channel	SCAT T1 8/14/2010	WP75 - boom needs replacing					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29925	-85.15990	(Y) / N
EPA-C-0075	Main Channel	SCAT T1 8/14/2010	WP-76 15:34 - pooled oil in upland need boom in this location to catch oil					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29978	-85.16070	(Y) / N
EPA-C-0076	Not Provided	SCAT T1 8/17/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29977	-85.16080	(Y) / N

Printed Team Members Name: MIKE ZAMBETIS (ENBRIDGE), HOWARD PLEAM, US EPA, Rachel Matthews (MDNRE)
Date: 9/18/10
Comments:
+ SATURATED SOIL AREA KNOWN LAB NEAR MP 13.25, AREA ADDED TO SCAT REASSESSMENT O&M LIST. NEAR EPA-C-0333 (N42.29979, W85.16132)

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 13-13.25 Right Bank While Looking Downstream											
EPA-C-0077	Main Channel	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30018	-85.16018	(Y) / N
EPA-C-0078	Not Provided	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30018	-85.16018	(Y) / N
SCC4-15	Shoreline	Shoreline Assessment	•		•	•	High volume flush. Grass flat snare boom and sorbent.		42.29938	-85.15717	(Y) / N

Printed Team Members Name: MIKE ZAMBETIS (ENBRIDGE), HOWARD PHAM, US EPA, Rachel Matthews (MDNRE)
Date: 9/19/10
Comments:

* SATURATED SOIL AREA ALONG WOODSLINE ON RIGHT DESCENDING BANK CONTINUES TO WICK OIL TO SURFACE. POINT ADDED TO SCAT REASSESMENT O&M LIST. +/- 4'x10' AREA (N42.29975, W85.15770)

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 13.00 **to MP** 13.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature _____ (date) 9-17-2010 Enbridge

Signature _____ (date) 9-17-2010 EPA
Eugene Dennis, EPA OSC

4. **SCAT Reassessment**

Signature _____ (date) 9/18/10 Enbridge
MICHAEL A. ZAMBETTI

Signature _____ (date) 9/18/10 EPA
HOWARD PHAM

Signature _____ (date) 9-18-2010 MDNRE
Rachel Mathews

5. **EPA**

Signature _____ (date) 9/22/10 EPA Division Supervisor
Jordan Garrard

Appendix E
Photographs

Field Photo Log – Segment 13.25



Photo 0809 – Facing southeast at right descending overbank near zone.



Photo 0812 – Facing southeast at right descending overbank near zone.

Field Photo Log – Segment 13.25



Photo 0813 – Facing southeast at right descending overbank near zone.



Photo 0814 – Facing southwest at right descending overbank near zone.

Field Photo Log – Segment 13.25



Photo 0816 – Facing southwest at right descending overbank near zone.



Photo 0819 – Facing east at left descending bank near zone D.

Field Photo Log – Segment 13.25



Photo 0821 – Facing southeast at left descending overbank near zone A.



Photo 0822 – Facing west at left descending overbank near zone A.

Field Photo Log – Segment 13.25



Photo 0827 – Facing northwest at left descending bank near EPA-C-0330.

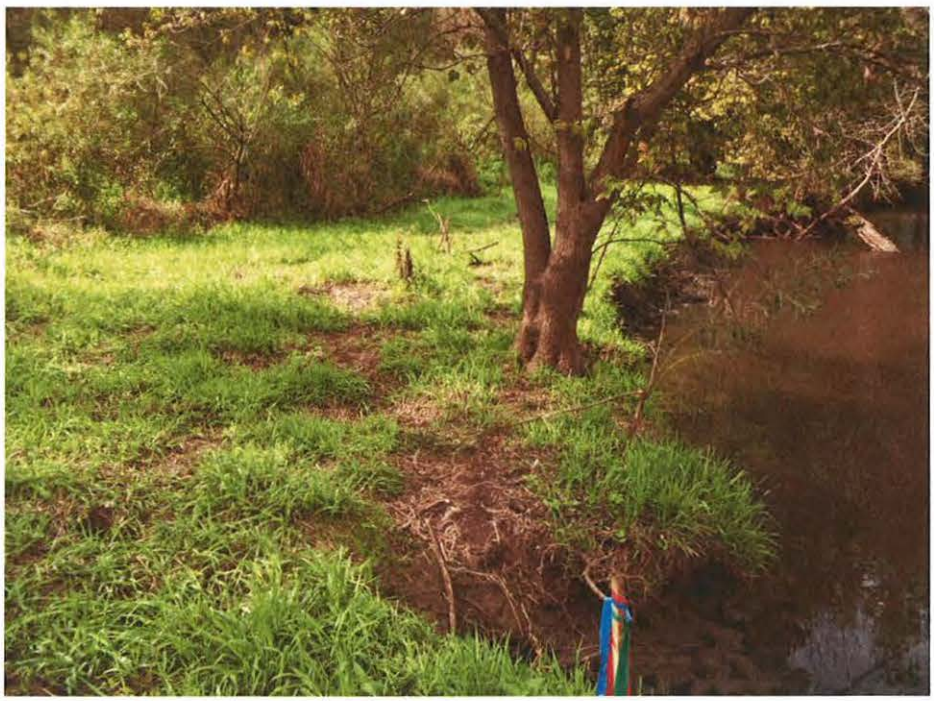


Photo 0828 – Facing west at left descending bank at EPA-C-0330.

Field Photo Log – Segment 13.25



Photo 0833 – Facing northwest at left descending overbank near EPA-C-0331.



Photo 0834 – Facing northwest at left descending overbank near EPA-C-0331.

Field Photo Log – Segment 13.25



Photo 0835 – Facing northwest at left descending overbank near EPA-C-0331.



Photo 0836 – Facing west at left descending overbank near EPA-C-0331.

Field Photo Log – Segment 13.25



Photo 0840 – Facing west at left descending bank.



Photo 0841 – Facing northeast at right descending bank near EPA-C-0077.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 13.50 – MP 13.25 to 13.50

Enbridge Energy

September 18, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 13.50 had moderate oiling on the left descending bank. The overbank area on the left descending bank contained oiled vegetation and oiled debris. There are no islands present in this segment. The right descending bank had light oiling. Both banks had areas of pooled oil and oiled overhanging vegetation. The overbank areas on the right descending bank contained some pooled oil.

Actions

Free oil was recovered from along the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 13.50 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- High volume, low pressure flushing for free oil removal with downstream booming absorbent booms and pads;
- Removal of oiled debris;
- Removal of overhanging vegetation;
- Removal of pooled oil.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled logs on right descending bank near MP 13.50 and SCC4-6;
- Oiled woody vegetation on left descending bank overbank near MP 13.25 (EPA-C-0083), EPA-C-0084, and EPA-C-0338 and on right descending bank near EPA-C-0086 and MP 13.25;

- Oiled woody vegetation on right descending overbank.

Segment 13.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

@ SCAT Point EPA-C-0333 - possible reemerging oil, Sump dug
will need to monitor for oil. N 42° 17.9991 W 85° 9.6759'
- oil seeping from cut bank (left descending Bank). Producing sheen
Currently boomed off

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

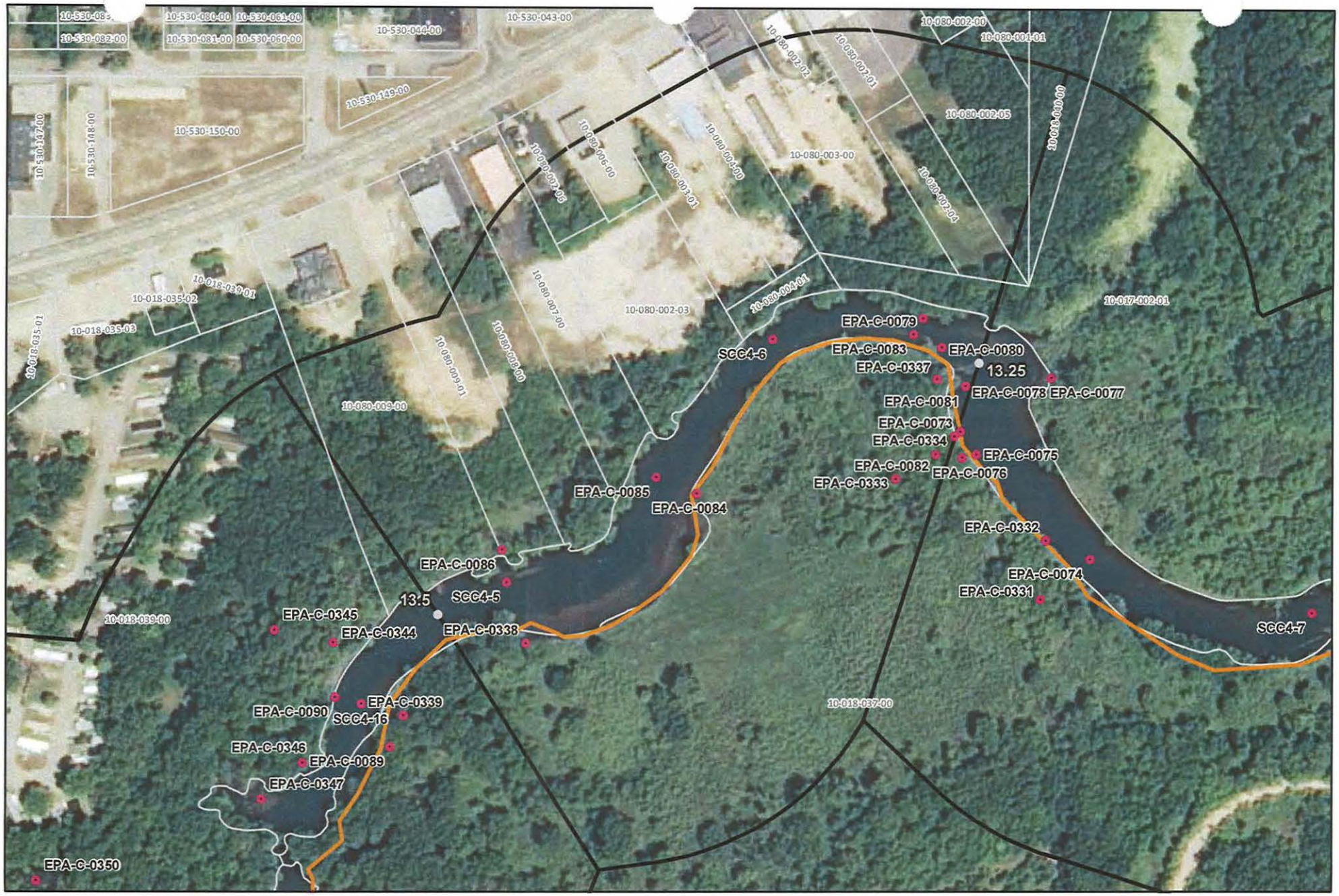
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 13.25-13.5 Left Bank While Looking Downstream										
EPA-C-0333	Shoreline	SCAT T2 08/28/2010	Throughout 1/4 mile isolated small <2x2 patches of oil coat/cover. photo 529 shows oiled veg					NA recommended	42.29966	-85.16127
EPA-C-0334	Shoreline & Overbank	SCAT T2 08/28/2010	continues into next quarter mile; photo 531 shows pooled oil; photo 532 is looking upstream from milepost 13.0. Throughout 1/4 mile isolated small <2x2 patches of oil coat/cover.					NA recommended	42.29988	-85.16086
EPA-C-0337	Shoreline & Overbank	SCAT T2 08/28/2010	oiled debris; near shore pooled oil is significant. photo 534 shows pooled oil in zone A. significant ponding oiled overhanging veg in this quarter mile has not been removed. sheen on water where river slows around bend. Also in same areas walking in water results in a sheen and tar balls. some sheen and tar balls in the water along this zone. significant ponding					significant oiled debris on snags-debris should be removed-not anchored debris.	42.30017	-85.16098
EPA-C-0338	Shoreline & Overbank	SCAT T2 08/28/2010	significant ponding oiled overhanging veg in this quarter mile has not been removed sheen on water where river slows around bend Also in same areas walking in water results in a sheen and tar balls. patchy oiled veg throughout; photo 536 is looking downstream from milepost 13.5.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29879	-85.16383
EPA-C-0079	Not Provided	SCAT T1 8/14/1024						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30048	-85.16108
EPA-C-0080	Not Provided	SCAT T1 8/14/1025						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30033	-85.16095
EPA-C-0081	Not Provided	SCAT T1 8/14/1026						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30013	-85.16078
EPA-C-0082	Not Provided	SCAT T1 8/14/1027						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29978	-85.16098
EPA-C-0083	Main Channel	SCAT T1 8/14/1028	WP-77 grass field need to river heavily coated 20 x 100 ft. Area of veg coated. Pooled oil. 1537 - need boom change. Low lying flood plain coated - workers laying pads - across from Baker Estates (200m)					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30040	-85.16115
EPA-C-0084	Shoreline & Overbank	SCAT T1 8/17/1041	1m x 1m pool of oil					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29957	-85.16265
SCC4-5	Shoreline	Shoreline Assessment	•		•	•	Shoreline impact is 10 to 15 ft onto bank. High volume flush.		42.29910	-85.16397
SCC4-6	Shoreline	Shoreline Assessment		•	•	•	Need to change out sorbent ASAP. Replace and add snare. Log jam and debris field with small amts of pooled oil.		42.30037	-85.16213





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 13.25-13.5
Left Bank While Looking Downstream

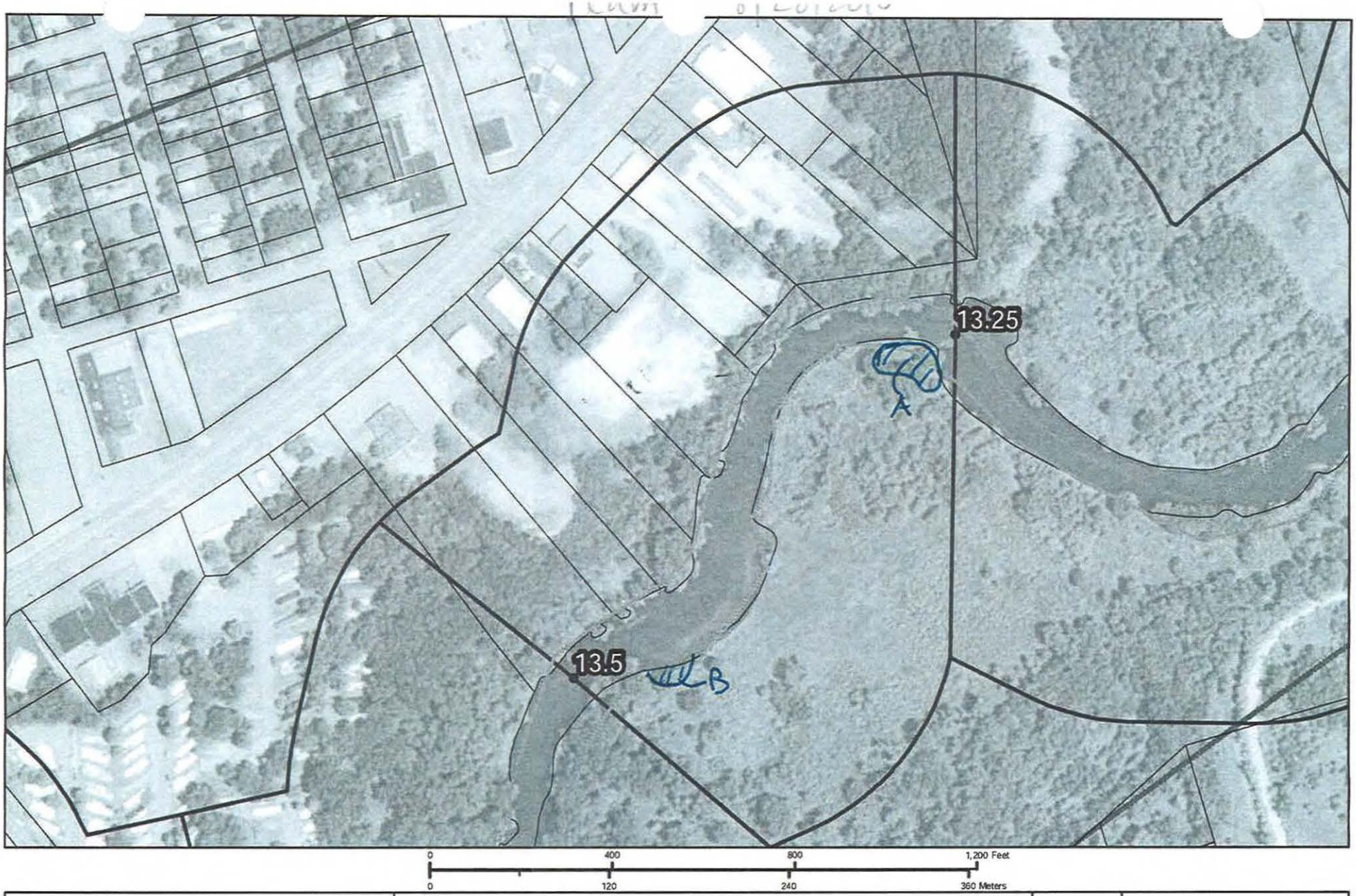
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuarterMileMarkers
Parcels_10200ftBuffer
Shoreline
River_QuarterMiles
Divisions

13.25 to 13.5

Division C: Mile Marker 13.25 - 13.5 Left Bank while looking downstream

Image: 2009 NAIP

SHEET #: 48

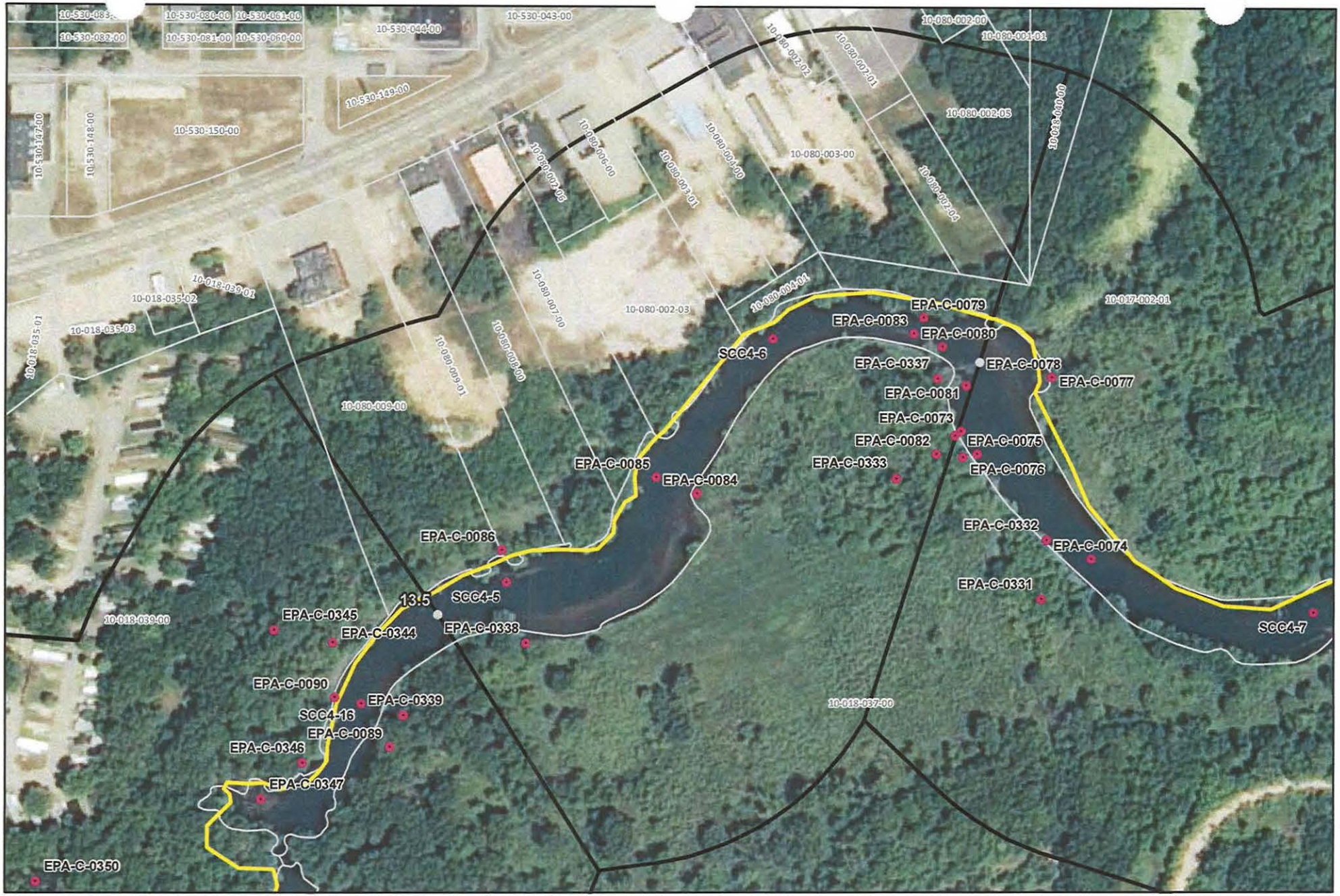
ENTRIX
Down to Earth. Down to Business.

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 13.25-13.5 Right Bank While Looking Downstream										
EPA-C-0085	Shoreline & Overbank	SCAT T1 8/18/1053	Pooled oil on and beyond shoreline					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29965	-85.16293
EPA-C-0086	Shoreline & Overbank	SCAT T1 8/18/1054	Pools of mousse and emulsified oil in the snag and overhanging vegetation					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29927	-85.16400





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 13.25-13.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/12/10 Time: AM / PM

Operations Division: C Segment ID: From 13.25 Start MP to End MP 13.50 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Jeff Reynolds

Division Supervisor(Contractor): Art Slyton

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT points verified & accepted.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT points verified & accepted.

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT points verified & accepted.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT points verified & accepted.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 09/x10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 13.25 **Start MP to End MP** 13.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

EPA Inspector: Chad Vice

Enbridge Inspector:

Division Supervisor(Contractor): Art Slayton

SCAT Reviewed – Description of Clean Up Required

Reviewed items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 13.25-13.5 Left Bank While Looking Downstream											
EPA-C-0333	Shoreline	SCAT T2 08/28/2010	Throughout 1/4 mile isolated small <2x2 patches of oil coat/cover. photo 529 shows oiled veg					NA recommended	42.29966	-85.16127	Y / N
EPA-C-0334	Shoreline & Overbank	SCAT T2 08/28/2010	continues into next quarter mile; photo 531 shows pooled oil; photo 532 is looking upstream from milepost 13.0. Throughout 1/4 mile isolated small <2x2 patches of oil coat/cover.					NA recommended	42.29988	-85.16086	Y / N
EPA-C-0337	Shoreline & Overbank	SCAT T2 08/28/2010	oiled debris; near shore pooled oil is significant. photo 534 shows pooled oil in zone A. significant ponding oiled overhanging veg in this quarter mile has not been removed. sheen on water where river slows around bend. Also in same areas walking in water results in a sheen and tar balls. some sheen and tar balls in the water along this zone. significant ponding					significant oiled debris on snags-debris should be removed-not anchored debris.	42.30017	-85.16098	Y / N
EPA-C-0338	Shoreline & Overbank	SCAT T2 08/28/2010	significant ponding oiled overhanging veg in this quarter mile has not been removed sheen on water where river slows around bend Also in same areas walking in water results in a sheen and tar balls. patchy oiled veg throughout; photo 536 is looking downstream from milepost 13.5.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29879	-85.16383	Y / N
EPA-C-0079	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30048	-85.16108	Y / N
EPA-C-0080	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30033	-85.16095	Y / N
EPA-C-0081	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30013	-85.16078	Y / N
EPA-C-0082	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29978	-85.16098	Y / N
EPA-C-0083	Main Channel	SCAT T1 8/14/2010	WP-77 grass field need to river heavily coated 20 x 100 ft. Area of veg coated. Pooled oil. 1537 - need boom change. Low lying flood plain coated - workers laying pads - across from Baker Estates (200m)					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30040	-85.16115	Y / N
EPA-C-0084	Shoreline & Overbank	SCAT T1 8/17/2010	1m x 1m pool of oil					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29957	-85.16265	Y / N
SCC4-5	Shoreline	Shoreline Assessment	•		•	•	Shoreline impact is 10 to 15 ft onto bank. High volume flush.		42.29910	-85.16397	Y / N
SCC4-6	Shoreline	Shoreline Assessment		•	•	•	Need to change out sorbent ASAP. Replace and add snare. Log jam and debris field with small amts of pooled oil.		42.30037	-85.16213	Y / N

Printed Team Members Name: BILL BATES, Rachel Matthews, MIKE ZAMBETIS
Date: 9/14/10
Comments:

mark identifies FPT-C-0073 & 0078 as being in segment 135, but map indicates that they are in 13.25

~~[illegible] 20% [illegible] veg~~ 20% where veg begins the veg is stained heavily, however, it

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 13.25-13.5 Right Bank While Looking Downstream											
EPA-C-0085	Shoreline & Overbank	SCAT T1 8/18/2010					Pooled oil on and beyond shoreline	Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29965	-85.16293	(Y) / N
EPA-C-0086	Shoreline & Overbank	SCAT T1 8/18/2010					Pools of mousse and emulsified oil in the snag and overhanging vegetation	Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29927	-85.16400	(Y) / N

Printed Team Members Name: Bill Bates
Rachel Matthews
Mike Zambetis
Date: 9/14/10
Comments:

SCC4-5 and SCC4-6 should be considered on the right bank, please refer to Left Bank page for Recommendations

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 13.25 **to MP** 13.5 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature Doug Deren (date) 13-Sept-10 Enbridge

Signature Eugene Dennis (date) 9-13-2010 EPA

4. **SCAT Reassessment**

Signature Michael A. Zambetis (date) 9/14/10 Enbridge

Signature William J Bates (date) 9/14/10 EPA

Signature Rachel Matthews (date) 9-14-2010 MDNRE

5. **EPA**

Signature Jordan Garrard (date) 9/20/10 EPA Division Supervisor

Appendix E
Photographs



Photo 0378 – Looking south at left descending bank, near EPA-C-0338 and SCC4-5.



Photo 0379 – Looking northeast at right descending bank, near EPA-C-0086.



Photo 0380 – Looking northeast at left descending bank, near EPA-C-0085.



Photo 0381 – Looking northwest at right descending bank, near EPA-C-0084.



Photo 0382 – Looking northeast at left descending bank, near SCC4-6.



Photo 0383 – Looking east at left descending bank (overbank),
near EPA-C-0083, EPA-C-0333, and EPA-C-0334.



Photo 0384 – Looking southeast at left descending bank (overbank),
near EPA-C-0083, EPA-C-0333, and EPA-C-0334.



Photo 0385 – Looking southwest at left descending bank (overbank),
near EPA-C-0037, EPA-C-0079, and EPA-C-0080.



Photo 0386 – Looking northwest at left descending bank (overbank),
near EPA-C-0073, EPA-C-0078, EPA-C-0081, and EPA-C-0082.



Photo 0387– Looking northwest at left descending bank (overbank),
near EPA-C-0073, EPA-C-0078, EPA-C-0081, and EPA-C-0082.

Field Photo Log – Segment 13.50



Photo 0388 – Looking northeast at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 13.75 – MP 13.50 to 13.75

Enbridge Energy

September 18, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 13.75 had moderate oiling on the left descending bank. An island with light to moderate oiling was present. The right descending bank had light oiling and oiled debris.. Both main channel banks had oiled overhanging vegetation. The left and right descending banks and the island contained areas of pooled oil. The overbank area contained areas of pooled oil, oiled vegetation (including emergent wetlands), oiled concrete blocks and oiled debris in Zone D.

Actions

Free oil was recovered from along the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 13.75 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- High volume low pressure flushing for free oil removal with downstream booming absorbent booms and pads;
- Removal of oiled debris;
- Removal of overhanging vegetation;
- High pressure flushing of man-made structures and/or rocks;
- Removal of pooled oil.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody vegetation on the left descending bank near MP 13.75 (EPA-C-0087) and on the island;

- Oiled woody vegetation on the left and right overbanks near SCC4-4 and EPA-C-0347 respectively;
- Oiled debris (logs) on right descending bank near MP 13.50, MP 13.75, and EPA-C-0344;
- Oiled rock/cobble on the right descending bank across from SCC4-3.

Segment 13.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 13.5-13.75 Left Bank While Looking Downstream										
EPA-C-0339	Shoreline & Overbank	SCAT T2 08/28/2010	small pooled oil pockets remain in in cleared area; photo 538 shows pooled oil; photo 537 is looking downstream from milepost 13.5					Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	42.29841	-85.16468
EPA-C-0340	Overbank	SCAT T2 08/28/2010	Area appears associated w/ residential					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29679	-85.16635
EPA-C-0341	Shoreline	SCAT T2 08/28/2010	overhanging veg is oiled but and remove <2"; photo 539 shows oiled debris on snag					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29729	-85.16637
EPA-C-0342	Overbank	SCAT T2 08/28/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29684	-85.16701
EPA-C-0343	Overbank	SCAT T2 08/28/2010	oiled mud and veg					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29708	-85.16719
EPA-C-0087	Not Provided	SCAT T1 8/14/1029						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29725	-85.16720
EPA-C-0088	Not Provided	SCAT T1 8/14/1030						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29720	-85.16640
EPA-C-0089	Not Provided	SCAT T1 8/14/1031						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29825	-85.16477
EPA-C-0090	Not Provided	SCAT T1 8/18/1055						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29850	-85.16515
SCC4-3	Shoreline	Shoreline Assessment	●	?	●		Small pockets of oil. Vac pac on hand snare.		42.29725	-85.16563
SCC4-4	Shoreline	Shoreline Assessment	●	?	●	●	Small pockets of oil. Vac pac on hand snare.		42.29725	-85.16392





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Division C: Mile Marker 13.5-13.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

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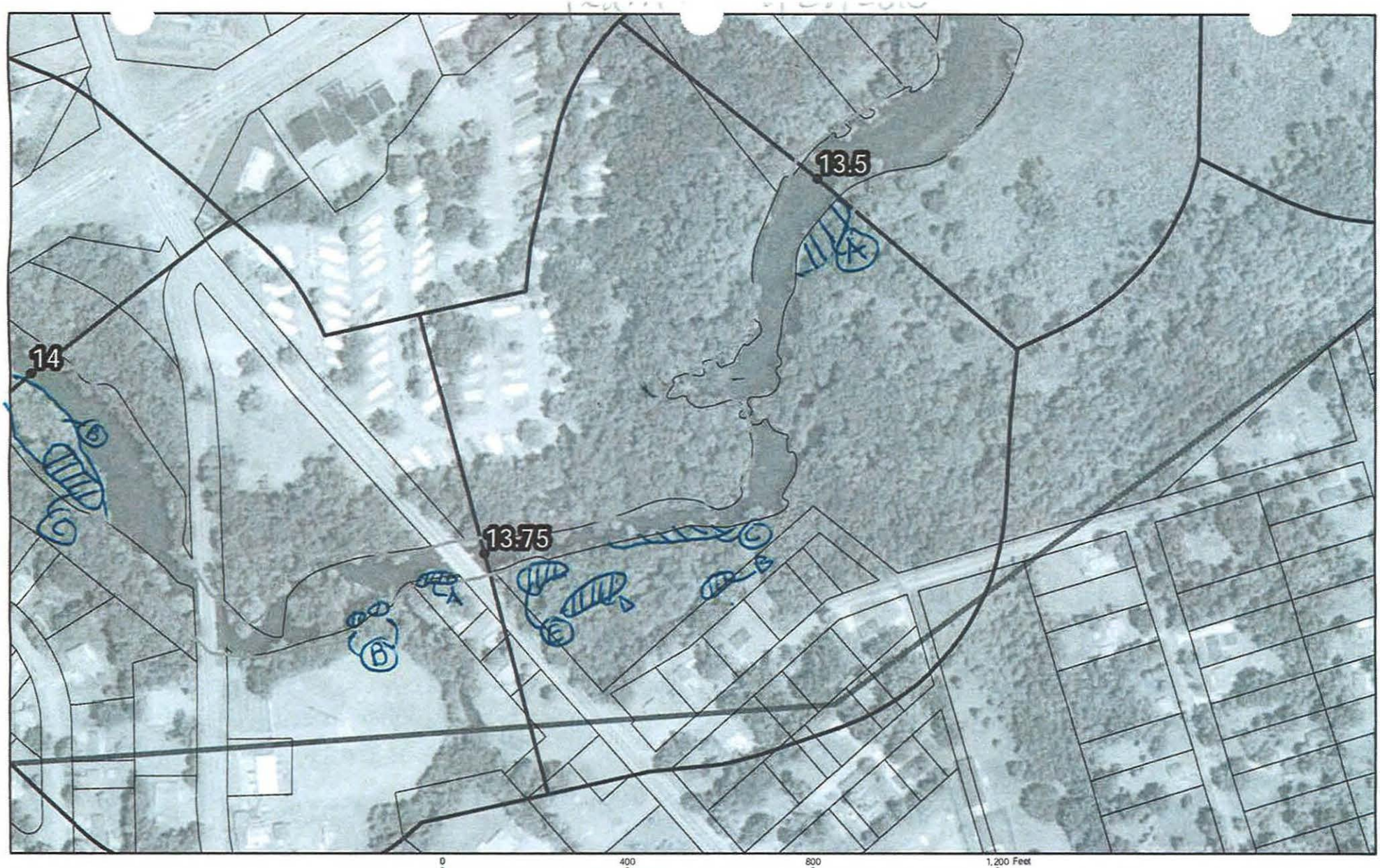
Coordinate System: NAD 1983 State Plane Michigan South Feet



QuartermileMarkers
Parcels_1020ftBuffer
Shoreline
River_QuarterMiles
Divisions

13.5 to 13.75

Division C: Mile Marker 13.5 - 13.75 Left Bank while looking downstream

Image: 2009 NAIP

SHEET #: 48

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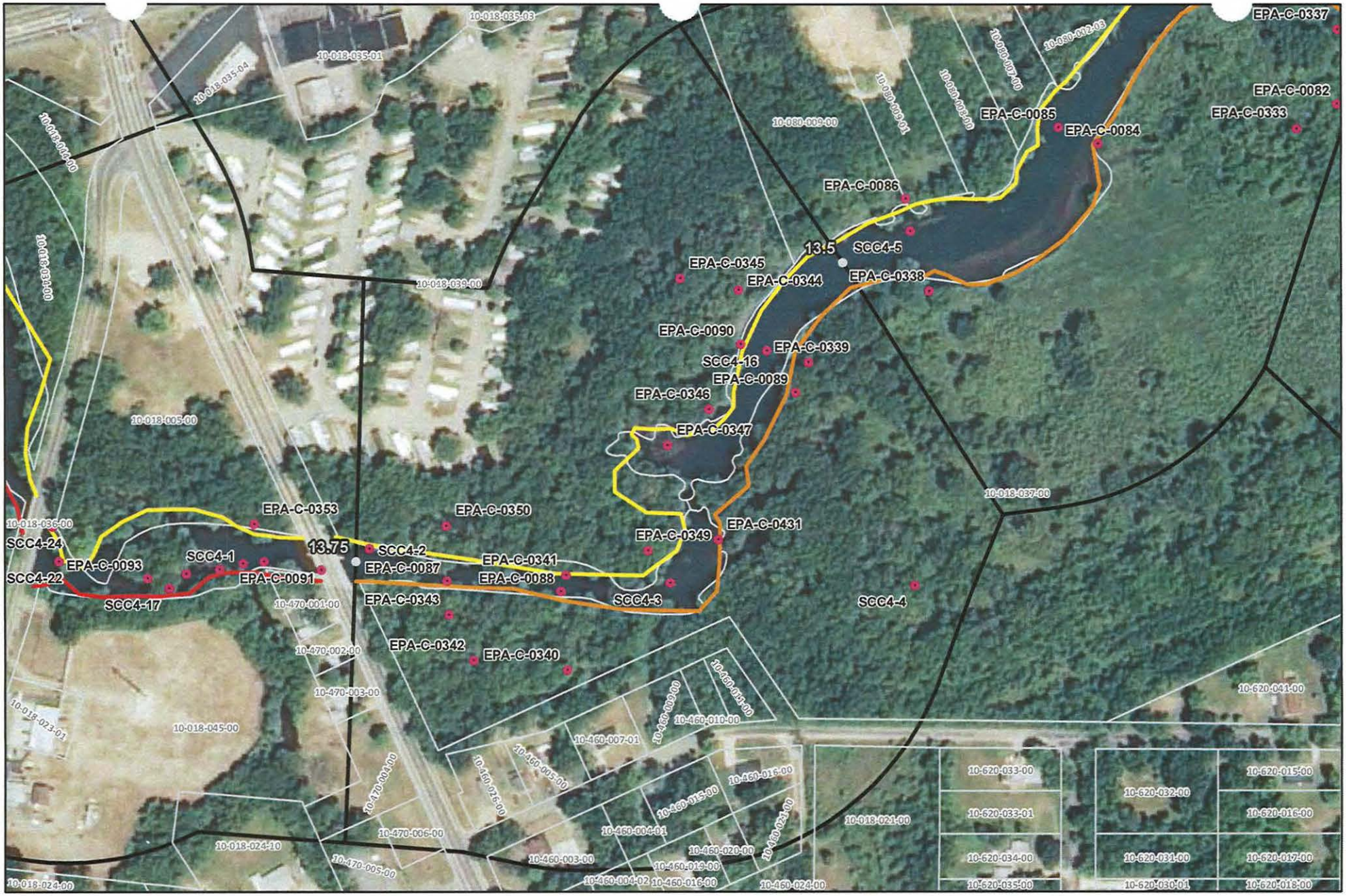
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 13.5-13.75 Island										
EPA-C-0431	Shoreline & Overbank	SCAT T3 8/30/10	One patch of pooled oil (1mX1M) at upstream end of island. GPS location is for the pooled oil. Oil thicker on the upstream side and on the side that is closest to the main channel. Many frogs were observed.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29748	-85.16530





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 13.5-13.75 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

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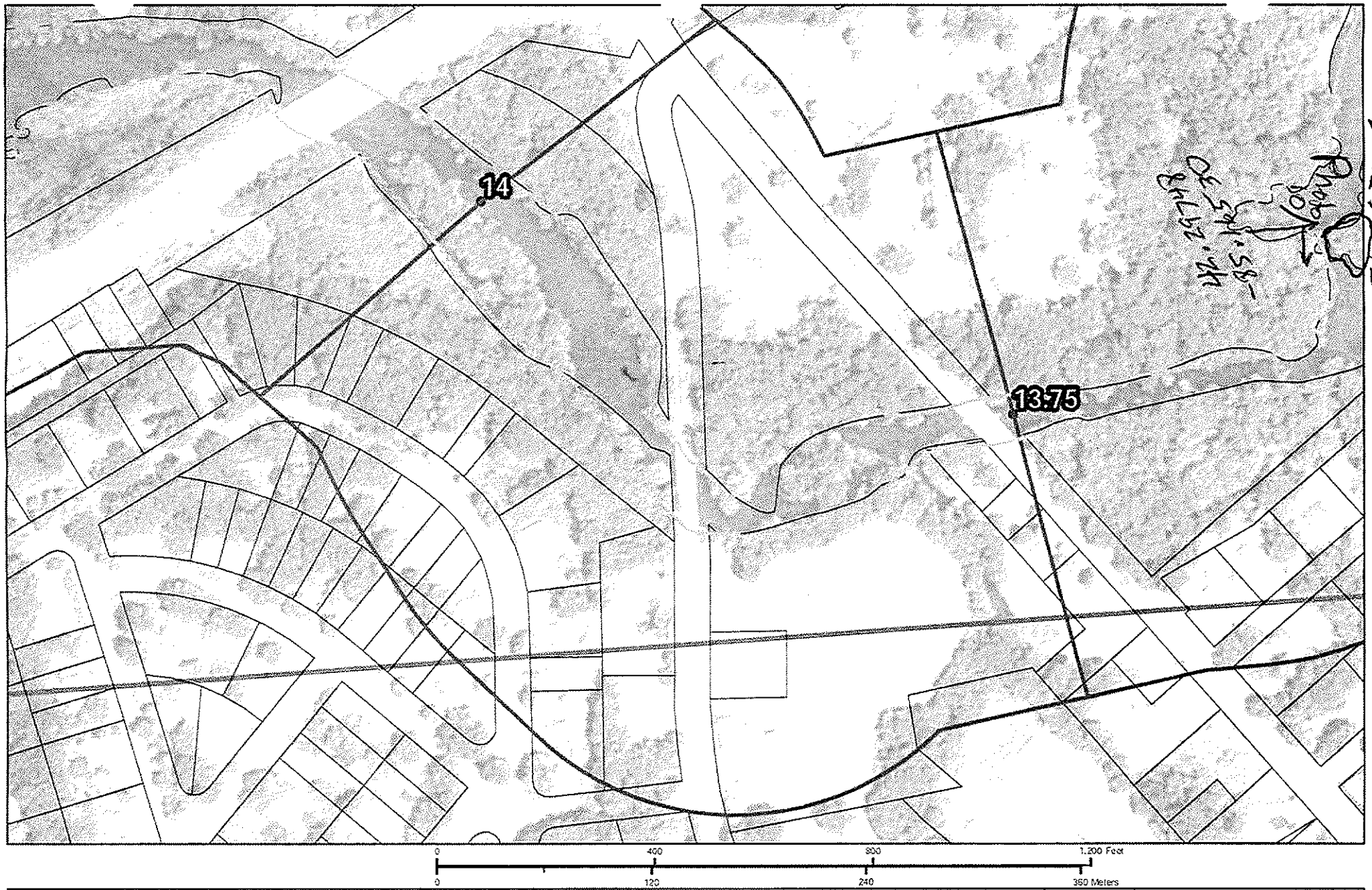
Coordinate System: NAD 1983 State Plane Michigan South Feet



Quartermile/Meters
Parcels_102008Buffer
Shoreline
River_QuarterMiles
Divisions

Division C: Mile Marker 13.5 - 13.75 Island

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2008 NAIP

SHEET # 48

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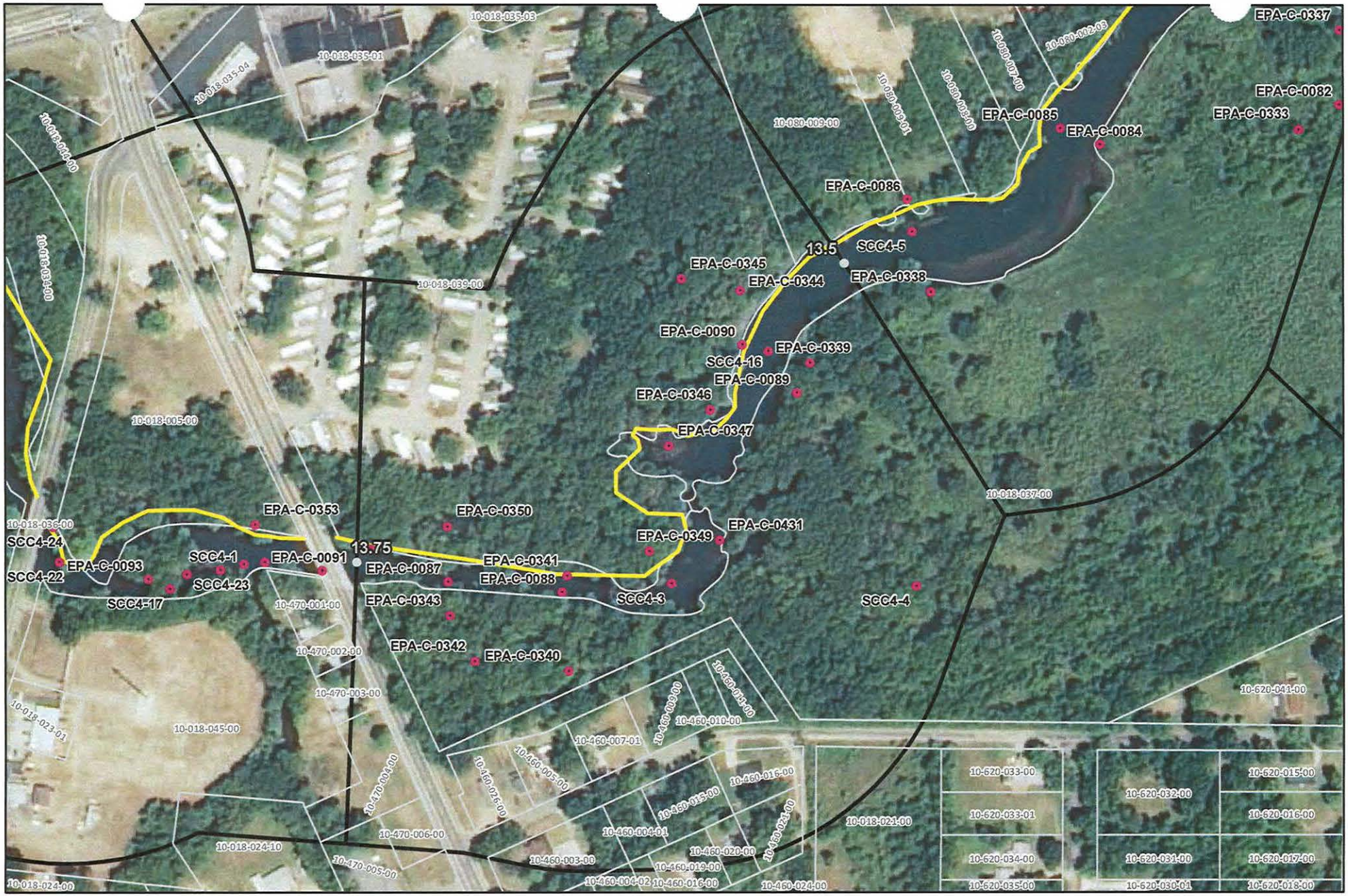
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 13.5-13.75 Right Bank While Looking Downstream										
EPA-C-0344	Shoreline	SCAT T4 8/28/2010	Overhanging vegetation and in stream woody debris are covered in oil. Some staining of vegetation onshore. We observed lots of toads and frogs in this area.					no remediation recomended.	42.29878	-85.16517
EPA-C-0345	Overbank	SCAT T4 8/28/2010	Zone B consists of an area that is 100ft inland and 100ft from trailer homes on hill. This zone has multiple patchy clumps of oiled debris. Photo 814 Refer to flag: 13.75/ zone B / Flag 1/ KMF. We observed lots of toads and frogs in this area.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29884	-85.16558
EPA-C-0346	Shoreline	SCAT T4 8/28/2010	Shoreline bank roots and instream debris are stained/coated. Film on water. Approx 50ft inland we took a photo of a tree stump greater than 4inch diameter that had been removed Silver reflective tape along shoreline. Sediment along shoreline stained. We observed lots of toads and frogs in this area.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29816	-85.16537
EPA-C-0347	Shoreline & Overbank	SCAT T4 8/28/2010	Emergent Wetland/mud flat. Very minimal sheen on water. Some staining on concrete blocks at the furthest inland point. Boom across where wetland meets river is in place. No clean-up recommendation. We observed lots of toads and frogs in this area.					Minimize entry (to prevent unnecessary substrate contamination).	42.29797	-85.16566
EPA-C-0349	Shoreline & Overbank	SCAT T4 8/28/2010	Zone F consists of shoreline overhanging veg and debri. Tarry pool on shoreline near fallen tree. Refer to Flag: 13.75/ Z-F/ F-3/ KMF. We observed lots of toads and frogs in this area.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29742	-85.16579
EPA-C-0350	Shoreline & Overbank	SCAT T4 8/28/2010	Zone G is an emergent wetland that has muddy edges with a slight sheen. We observed lots of toads and frogs in this area.					Minimize entry (to prevent unnecessary substrate contamination).	42.29754	-85.16721
SCC4-2	Shoreline	Shoreline Assessment	•		•		High volume flush - brush cutting, some grass impact. Note: small marsh. Need closer inspection.		42.29742	-85.16775
SCC4-16	Shoreline	Shoreline Assessment		•			High impact on private property.		42.29847	-85.16497





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Division C: Mile Marker 13.5-13.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

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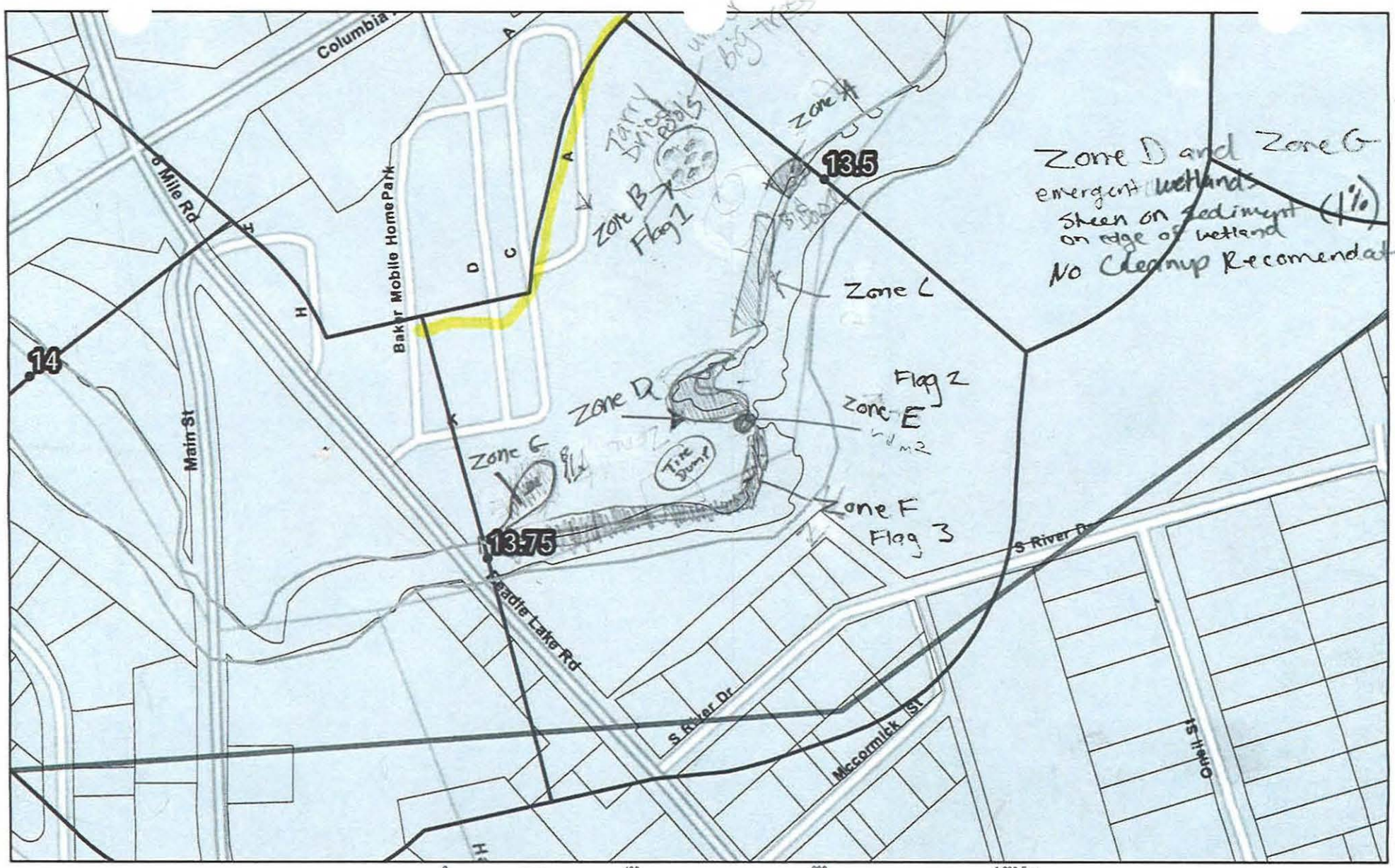
Coordinate System: NAD 1983 State Plane Michigan South Feet



Division C: Mile Marker 13.5 - 13.75 Right Bank while looking downstream

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/12/10 Time: AM / PM

Operations Division: C Segment ID: From 13.50 Start MP to End MP 13.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Jeff Reynolds

Division Supervisor(Contractor): Art Slayton

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points accepted.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points accepted.

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points verified & accepted.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points verified & accepted.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 09/21/10 Time: AM / PM

Operations Division: C Segment ID: From 13.5 Start MP to End MP 13.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

~~EPA Inspector:~~

Enbridge Inspector: Chad Vo, Chad Vile

Division Supervisor(Contractor): Art Slayton

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 13.5-13.75 Right Bank While Looking Downstream											
EPA-C-0344	Shoreline	SCAT T4 8/28/2010	Overhanging vegetation and in stream woody debris are covered in oil. Some staining of vegetation onshore. We observed lots of toads and frogs in this area.					no remediation recomended.	42.29878	-85.16517	Y / N
EPA-C-0345	Overbank	SCAT T4 8/28/2010	Zone B consists of an area that is 100ft inland and 100ft from trailer homes on hill. This zone has multiple patchy clumps of oiled debris. Photo 814 Refer to flag: 13.75/ zone B / Flag 1/ KMF. We observed lots of toads and frogs in this area.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29884	-85.16558	Y / N
EPA-C-0346	Shoreline	SCAT T4 8/28/2010	Shoreline bank roots and instream debris are stained/coated. Film on water. Approx 50ft inland we took a photo of a tree stump greater than 4inch diameter that had been removed Silver reflective tape along shoreline. Sediment along shoreline stained. We observed lots of toads and frogs in this area.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29816	-85.16537	Y / N
EPA-C-0347	Shoreline & Overbank	SCAT T4 8/28/2010	Emergent Wetland/mud flat. Very minimal sheen on water. Some staining on concrete blocks at the furthest inland point. Boom across where wetland meets river is in place. No clean-up recommendation. We observed lots of toads and frogs in this area.					Minimize entry (to prevent unnecessary substrate contamination).	42.29797	-85.16566	Y / N
EPA-C-0349	Shoreline & Overbank	SCAT T4 8/28/2010	Zone F consists of shoreline overhanging veg and debri. Tarry pool on shoreline near fallen tree. Refer to Flag: 13.75/ Z-F/ F-3/ KMF. We observed lots of toads and frogs in this area.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29742	-85.16579	Y / N
EPA-C-0350	Shoreline & Overbank	SCAT T4 8/28/2010	Zone G is an emergent wetland that has muddy edges with a slight sheen. We observed lots of toads and frogs in this area.					Minimize entry (to prevent unnecessary substrate contamination).	42.29754	-85.16721	Y / N
SCC4-2	Shoreline	Shoreline Assessment	•		•		High volume flush - brush cutting, some grass impact. Note: small marsh. Need closer inspection.		42.29742	-85.16775	Y / N
SCC4-16	Shoreline	Shoreline Assessment		•			High impact on private property.		42.29847	-85.16497	Y / N

Printed Team Members Name: Rachel Matthews, William Bates, Michael Zambetis
Date: 9-14-2010
Comments:

PO-19 (8/16) Small inland wetland oiled tracked in by animal 42.299 -85.166 Y / N

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 13.5-13.75 Left Bank While Looking Downstream											
EPA-C-0339	Shoreline & Overbank	SCAT T2 08/28/2010	small pooled oil pockets remain in in cleared area; photo 538 shows pooled oil; photo 537 is looking downstream from milepost 13.5					Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	42.29841	-85.16468	Y / N
EPA-C-0340	Overbank	SCAT T2 08/28/2010	Area appears associated w/ residential					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29679	-85.16635	Y / N
EPA-C-0341	Shoreline	SCAT T2 08/28/2010	overhanging veg is oiled but and remove <2"; photo 539 shows oiled debris on snag					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29729	-85.16637	Y / N
EPA-C-0342	Overbank	SCAT T2 08/28/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29684	-85.16701	Y / N
EPA-C-0343	Overbank	SCAT T2 08/28/2010	oiled mud and veg					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29708	-85.16719	Y / N
EPA-C-0087	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29725	-85.16720	Y / N
EPA-C-0088	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29720	-85.16640	Y / N
EPA-C-0089	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29825	-85.16477	Y / N
EPA-C-0090	Not Provided	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29850	-85.16515	Y / N
SCC4-3	Shoreline	Shoreline Assessment	●	?	●		Small pockets of oil. Vac pac on hand snare.		42.29725	-85.16563	Y / N
SCC4-4	Shoreline	Shoreline Assessment	●	?	●	●	Small pockets of oil. Vac pac on hand snare.		42.29725	-85.16392	Y / N

Printed Team Members Name: Rachel Matthews, William Batts, Michael Zambeti
Date: 9-14-2010
Comments:

PO-20 (8/18) Wetland with absorbant pads, should be removed 42.298 -85.165 Y / N
PO-28 (8/18) Oiled pool, should be removed 42.97 -85.167 Y / N
PO-29 (8/18) Oiled field, remove pooled oil 42.298 -85.165 Y / N

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 13.5-13.75 Island											
EPA-C-0431	Shoreline & Overbank	SCAT T3 8/30/2010					One patch of pooled oil (1mX1M) at upstream end of island. GPS location is for the pooled oil. Oil thicker on the upstream side and on the side that is closest to the main channel. Many frogs were observed.	Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29748	-85.16530	(Y) / N

Printed Team Members Name: Team 2 Mike Zambetis
Rachel Matthews
Bill Bates
Date: 9-14-2010
Comments:

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 13.50 **to MP** 13.75 **Segment Length: 0.25 mile**

1. **SCAT** ☑
2. **Clean up** ☒
3. **Inspection**

14-Sept-10 — Signature (date) — Enbridge

9-14-2010 — Signature (date) Eugene Dennis, EPA OSC — EPA

4. **SCAT Reassessment**

9/14/10 — Signature MICHAEL A. ZAMBETTI (date) — Enbridge

9/14/10 — Signature WILLIAM J BATES (date) — EPA

9-14-2010 — Signature Rachel Matthews (date) — MDNRE

5. **EPA**

9/21/10 — Signature Jordan Garland (date) — EPA Division Supervisor

lower areas holding water on left bank, lower areas contain light sheen. May need to be monitored and evaluated for submerged oil.

Appendix E
Photographs



Photo 0359 – Looking south at left descending bank (overbank), near EPA-C-0342.



Photo 0360 – Looking west at left descending bank, near EPA-C-0087.



Photo 0361 – Looking north at right descending bank (overbank), near EPA-C-0350.



Photo 0362 – Looking south at left descending bank (overbank), near EPA-C-0340.



Photo 0363 – Looking north at right descending bank (overbank), near EPA-C-0350.



Photo 0364 – Looking southeast at left descending bank, near EPA-C-0088.



Photo 0365 – Looking northeast at right descending bank, near EPA-C-0341.



Photo 0366 – Looking east at left descending bank, near SCC4-3.



Photo 0367 – Looking northwest at right descending bank, near EPA-C-0349.



Photo 0368 – Looking southeast at left descending bank, near EPA-C-0089.

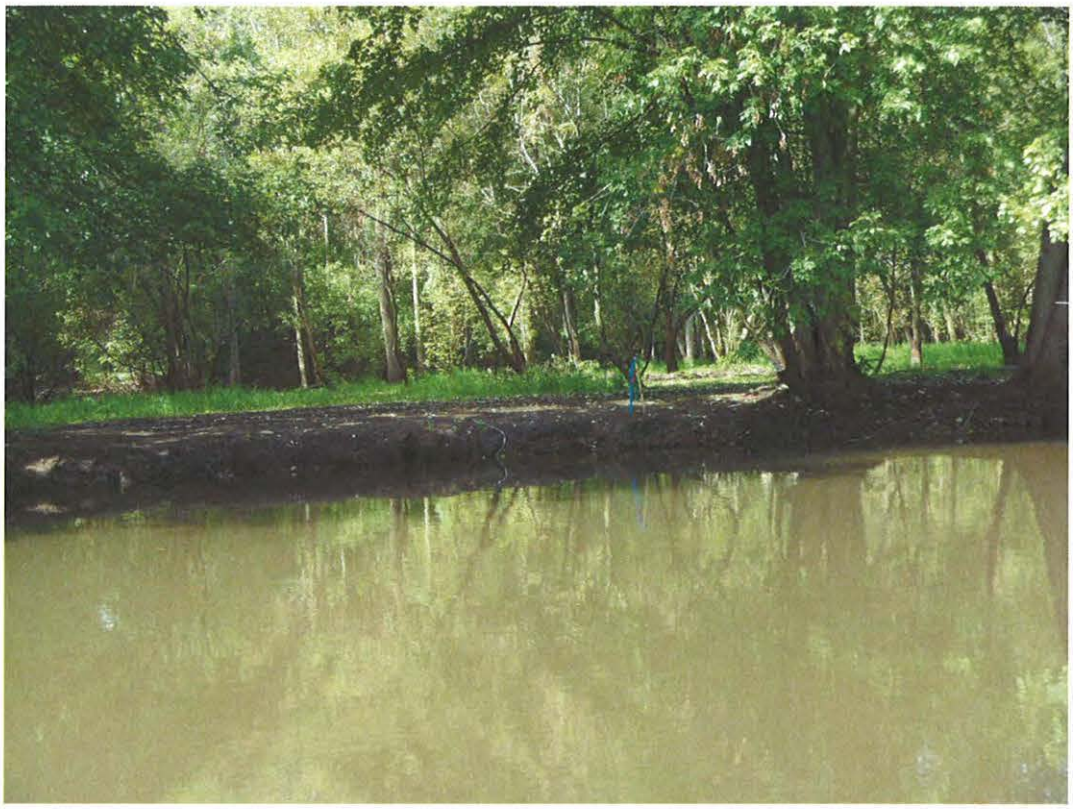


Photo 0369 – Looking north at right descending bank, near EPA-C-0090.



Photo 0370 – Looking southeast at left descending bank, near EPA-C-0339, SCC4-4 and SCC4-16.



Photo 0371 – Looking south at left descending bank (overbank), near SCC4-4.



Photo 0373 – Looking west at island, near EPA-C-0431.



Photo 0374 – Looking north at right descending bank, near EPA-C-0090.



Photo 0375 – Looking southwest at right descending bank, near EPA-C-0334.



Photo 0376 – Looking southwest at right descending bank (overbank), near EPA-C-0335.

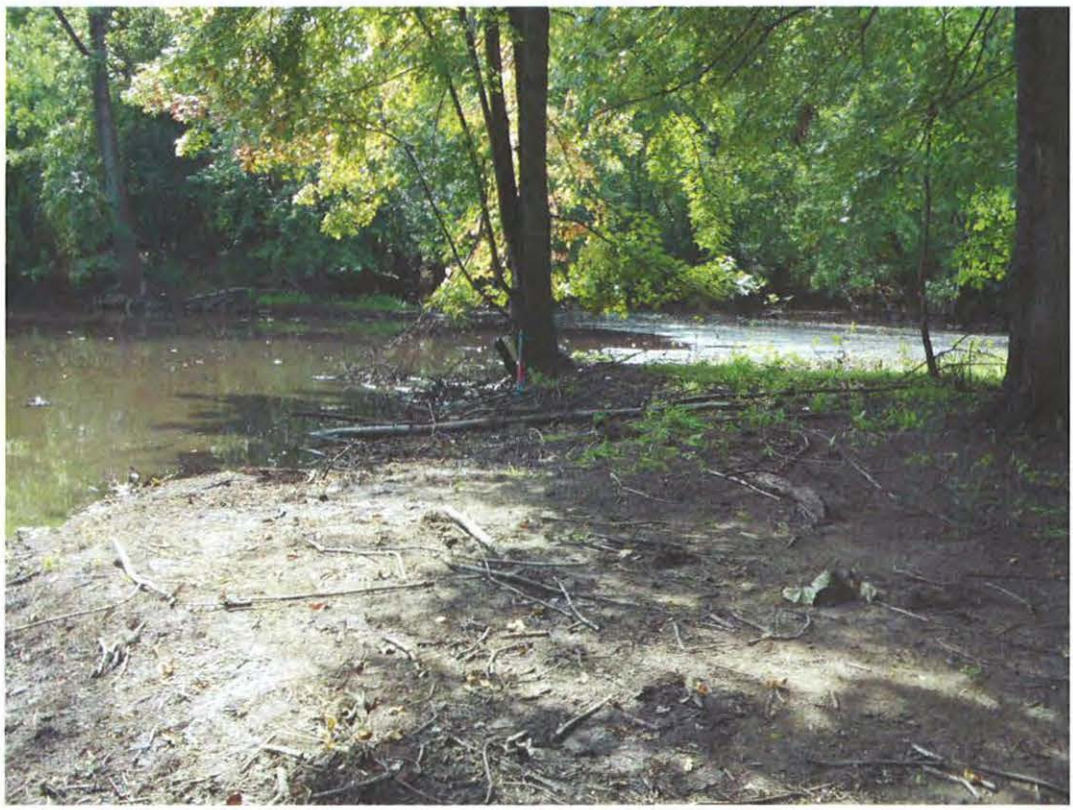


Photo 0377 – Looking southwest at right descending bank, near EPA-C-0346 and EPA-C-0347.



Photo 0394 – Looking north at right descending bank, near SCC4-2.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 14.00 – MP 13.75 to 14.00

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 14.00 had light to moderate oiling with oiled debris, rocks and vegetation on the left descending bank. Two islands were present with moderate to high oiling observed. The downstream island is also in Segment 14.50 and light to moderate oiling was observed. The right descending bank had light oiling with pooled oil in the floodplain and grass. The right overbank contained vegetation and debris that was impacted. Two bridges were located in this segment that needed the piers cleaned.

Actions

Free oil was recovered from along the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 14.00 consisted of the following:

- Removal of woody vegetation less than 2" in diameter. However, it was noted that some live wood greater than 2" and dead wood greater than 4" was removed;
- Removal of oiled vegetation leaving roots intact;
- High volume low pressure flushing for free oil removal with downstream booming, absorbent booms and pads;
- Removal of oiled debris;
- High pressure flushing of man-made structures and/or rocks;
- Removal of pooled oil (overbank only).

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along left descending bank in SCAT Zone C, near MP 13.75;

- Oiled soil along right descending bank between the Beadle Lake Road and Main Street bridges;
- Oiled soil on both islands and sheen was noted in beaver holes;
- Oiled woody vegetation on the left descending bank downstream of the Main Street bridge;
- Oiled woody vegetation on the right descending bank and overbank between the Beadle Lake Road and Main Street bridges;
- Oiled woody vegetation on both islands;
- Oiled rock/cobble was left on the left descending bank between the Beadle Lake Road and Main Street bridges;
- Oiled Man-made material were at both the Beadle Lake Road and Main Street bridges on both the left and right descending banks.

Segment 14.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial photo and sketch map)
    - Island/Sandbar
      - Operations Cleanup Recommendation Table
      - Figures (aerial photo and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table
    - Island/Sandbar-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

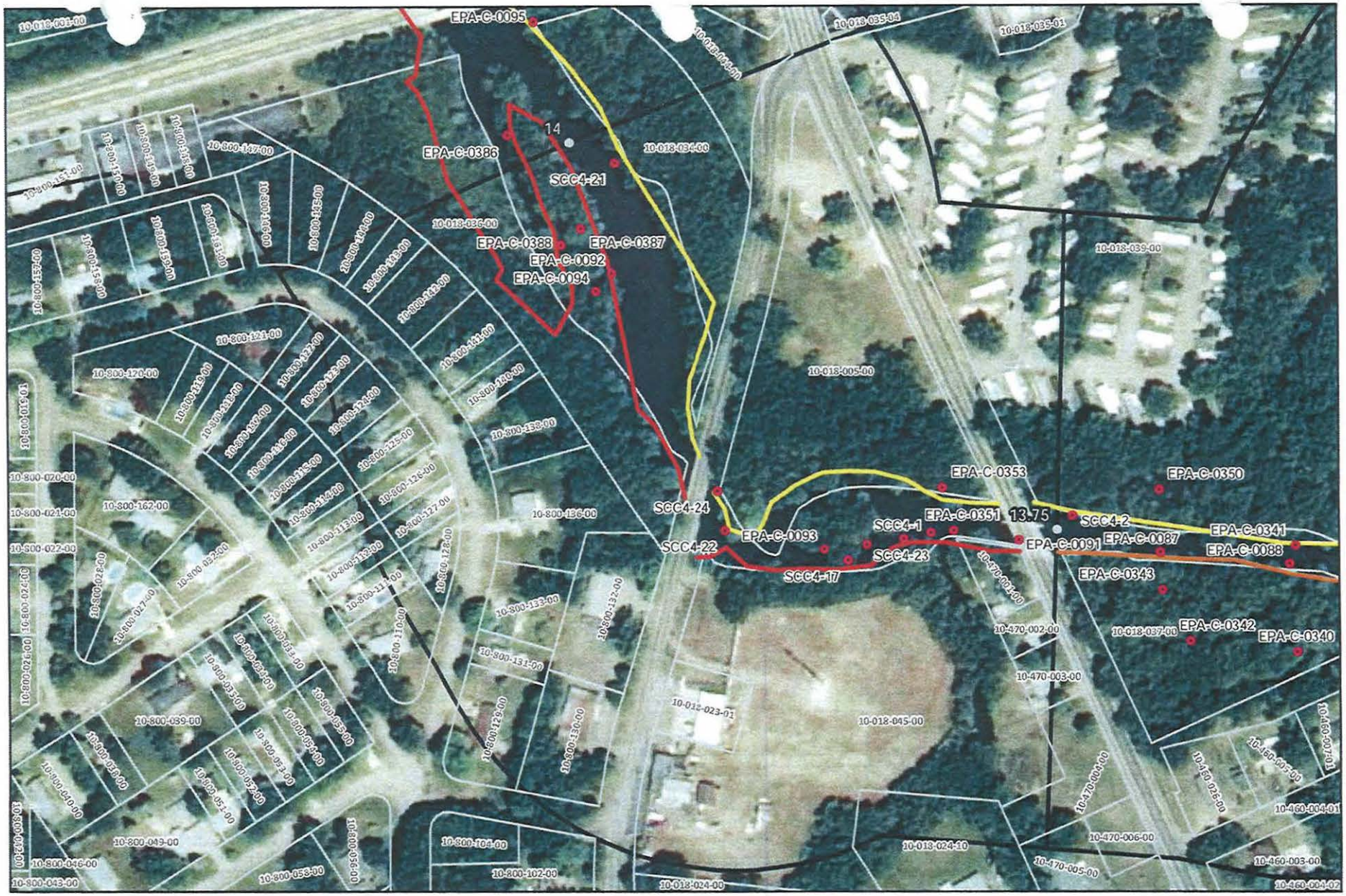
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 13.75-14 Island										
EPA-C-0387	Island	SCAT 08/28/10	Zone B is entire Island. Coated veg on south side of island can cut. workers present cleaning oiled woody debris					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29873	-85.17083
EPA-C-0388	Island	SCAT 08/28/10	pooled oil and sheen oil pools from GPs upstream to end of island in small pockets woody debris. workers present cleaning oiled woody debris					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29865	-85.17095
EPA-C-0093	Shoreline & Overbank	SCAT T1 8/17/10	10m x 25m area of pooled oil					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29725	-85.16930



Division C: Mile Marker 13.75-14 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

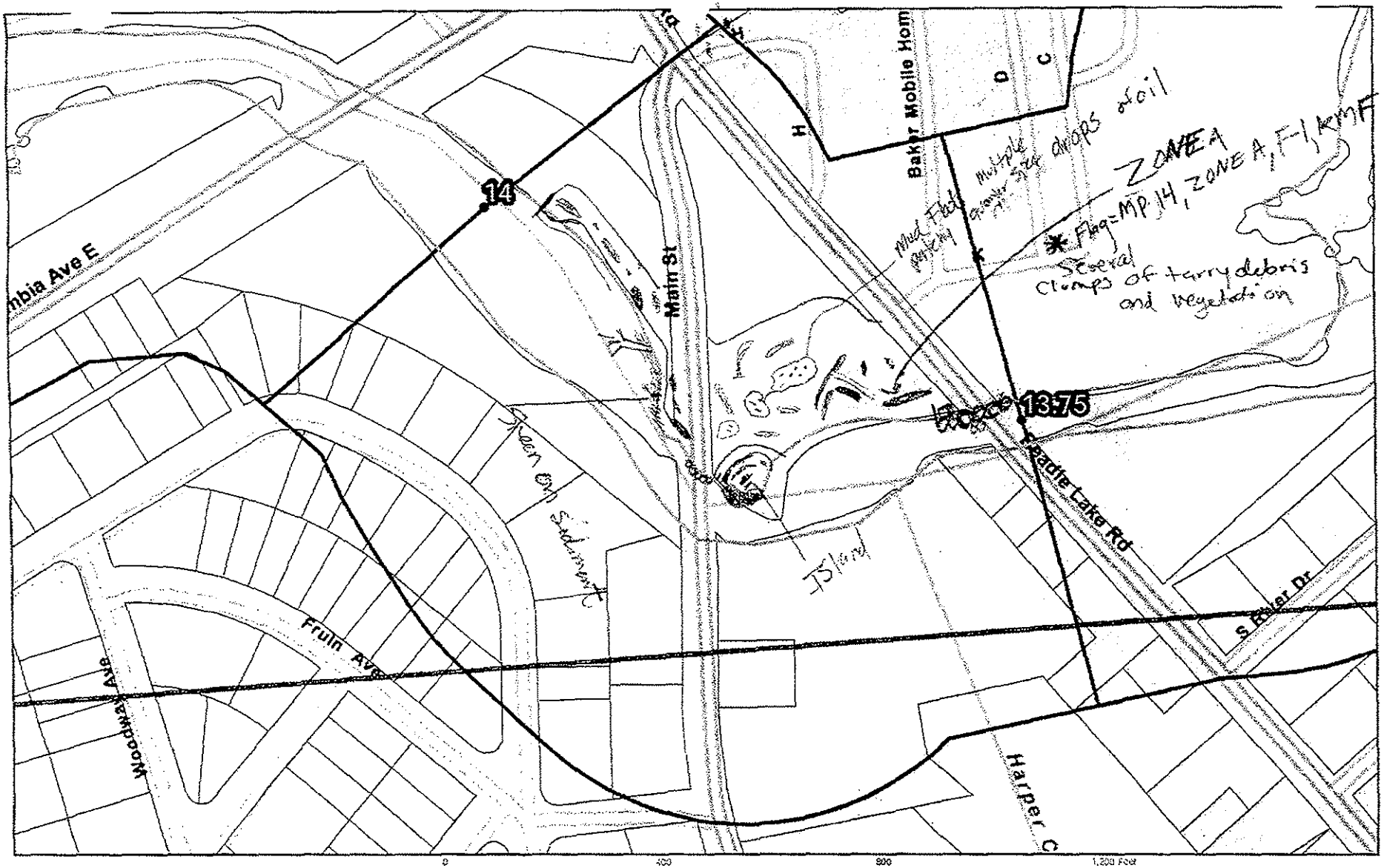
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Team 4
8/28/10

only 1 zone = Zone A

only flagged [illegible] of tarry debris & Sediment

13.75 to 14.0

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

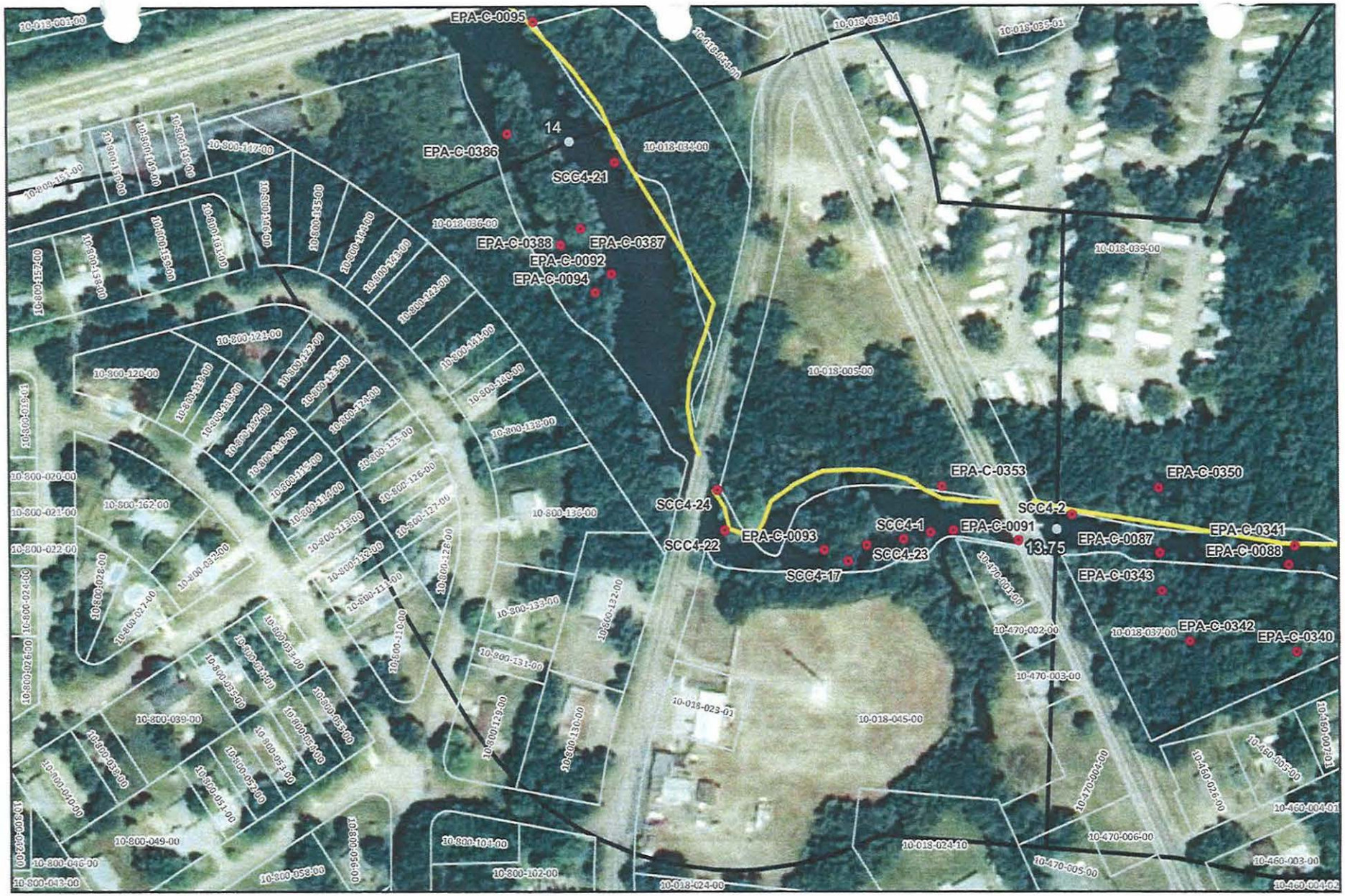
ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN [illegible] FEET

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 13.75-14 Right Bank While Looking Downstream										
EPA-C-0353	Shoreline/Overbank	SCAT T4 8/28/10	Flag piced at dried tarry, pool-like area. Flag. MP-14.0 Z-A F-1 KMF Large logs w/oiled debris collected around them (from high current). Staining on trees, tarry vegetation (patches). Zone A also includes a small island just upstrea of the Main St. Lots of frogs and toads (live).					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29754	-85.16856
SCC4-1	Shoreline	Shoreline Assessment	•		•		Minimum amount of oiling on banks. Brush cutting.		42.29733	-85.16863
SCC4-17	Shoreline	Shoreline Assessment	•	•	•	•	Small island. Oiling is high. Debris field with small amount of pooled oil.		42.29720	-85.16915
SCC4-21	Shoreline	Shoreline Assessment	•		•		High volume flush. Grass flat snare boom and sorbent.		42.29903	-85.17062
SCC4-22	Shoreline	Shoreline Assessment	•	•	•		Small island floodplain. Oiling is moderate to high in brush. Grass has some pooled oil. High volume flush.		42.29733	-85.16992





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 13.75-14
Right Bank While Looking Downstream

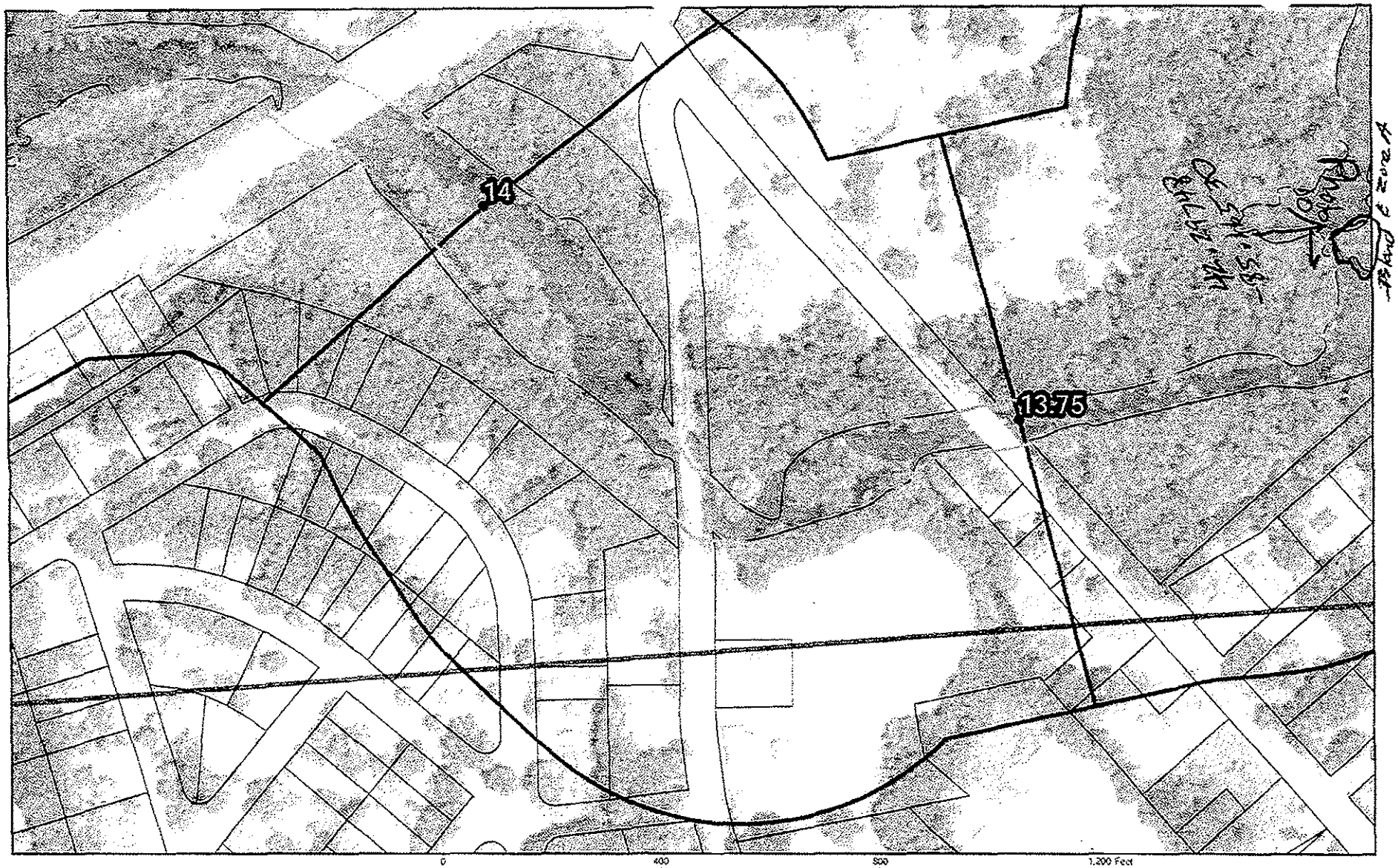
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



13.75 to 14.0

Enbridge Pipeline Relea[illegible] Incident – Kalamazoo River Oil Spill

ENTRIX
Down to Earth. Down to Business.
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Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 13.75-14 Left Bank While Looking Downstream										
EPA-C-0351	Shoreline	SCAT T2 8/28/10	residence with oiled riprap onshore. sheen on water. photo 541 is looking downstream from milepost 13.75.					over hanging oiled veg needs lobe out	42.29734	-85.16849
EPA-C-0352	Shoreline	SCAT T2 8/28/10	sheen on water. several snags w/ mousse and accumulated debris; photos 542 and 543 show snags; photo 544 is looking upstream from milepost 14.0					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29727	-85.16903
EPA-C-0091	Main Channel	SCAT T1 8/14/10						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29730	-85.16808
EPA-C-0092	Main Channel	SCAT T1 8/14/10	WP79 - oil back into wooded wetland					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29852	-85.17063
EPA-C-0094	Not Provided	SCAT T1 8/17/10						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29843	-85.17073
SCC4-23	Shoreline	Shoreline Assessment		•		•	Logjam with small amt of pooled oil.		42.29730	-85.16880
SCC4-24	Shoreline	Shoreline Assessment	•		•	•	Banks steep south to floodplain oiling is 3-4. (Moderate)		42.29752	-85.16997


EPA-C-0095
14
EPA-C-0886
SCC4-21
EPA-C-0387
EPA-C-0388
EPA-C-0092
EPA-C-0094
SCC4-24
SCC4-22
EPA-C-0093
SCC4-17
EPA-C-0352
SCC4-1
EPA-C-0353
EPA-C-0351
SCC4-2
EPA-C-0350
EPA-C-0341
SCC4-23
EPA-C-0091
EPA-C-0087
EPA-C-0343
EPA-C-0088
EPA-C-0342
EPA-C-0340
10-018-035-04
10-018-035-01
10-018-034-00
10-018-035-00
10-018-039-00
10-018-005-00
10-800-147-00
10-800-151-00
10-800-153-00
10-800-154-00
10-800-155-00
10-800-156-00
10-800-157-00
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10-800-190-00
10-800-191-00
10-800-192-00

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/12/10 Time: AM / PM

Operations Division: C Segment ID: From 13-75 Start MP to End MP 14.00 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Jeff Reynolds

Division Supervisor(Contractor): Art Slaughter

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points accepted.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points accepted.

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points accepted.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points accepted.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 09/12/10 Time: AM / PM

Operations Division: C Segment ID: From 13.75 Start MP to End MP 14 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

~~EPA Inspector~~:

Enbridge Inspector: [signature] Chad Vice

Division Supervisor(Contractor): [signature] Art Slyton

SCAT Reviewed – Description of Clean Up Required

Reviewed all SCAT items.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work complete

Punchlist Items Identified

☐ Punchlist Items Complete (add check on punchlist item when completed)

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 13.75-14 Left Bank While Looking Downstream											
EPA-C-0351	Shoreline	SCAT T2 8/28/2010	residence with oiled riprap onshore. sheen on water. photo 541 is looking downstream from milepost 13.75.					over hanging oiled veg needs tobe out	42.29734	-85.16849	Y / N
EPA-C-0352	Shoreline	SCAT T2 8/28/2010	sheen on water. several snags w/ mousse and accumulated debris; photos 542 and 543 show snags; photo 544 is looking upstream from milepost 14.0					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29727	-85.16903	Y / N
EPA-C-0091	Main Channel	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29730	-85.16808	Y / N
EPA-C-0092	Main Channel	SCAT T1 8/14/2010	WP79 - oil back into wooded wetland					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29852	-85.17063	Y / N
EPA-C-0094	Not Provided	SCAT T1 8/17/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29843	-85.17073	Y / N
SCC4-23	Shoreline	Shoreline Assessment		•		•	Logjam with small amt of pooled oil.		42.29730	-85.16880	Y / N
SCC4-24	Shoreline	Shoreline Assessment	•		•	•	Banks steep south to floodplain oiling is 3-4. (Moderate)		42.29752	-85.16997	Y / N

Printed Team Members Name: Dana Sirowe (MDNRE), HOWARD PRAM, EPA. Jack Ross, Enbridge
Date: 9/15/10
Comments: EPA-C-0351 - vegetation removed, but rip rap is still oiled & landowner requested it be addressed
Flag SCC-4-1 is upstream of SCC4-23

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 13.75-14 Right Bank While Looking Downstream											
SCC4-1	Shoreline	Shoreline Assessment	●		●		Minimum amount of oiling on banks. Brush cutting.		42.29733	-85.16863	Y / N
SCC4-17	Shoreline	Shoreline Assessment	●	●	●	●	Small island. Oiling is high. Debris field with small amount of pooled oil.		42.29720	-85.16915	Y / N
SCC4-21	Shoreline	Shoreline Assessment	●		●		High volume flush. Grass flat snare boom and sorbent.		42.29903	-85.17062	Y / N
SCC4-22	Shoreline	Shoreline Assessment	●	●	●		Small island floodplain. Oiling is moderate to high in brush. Grass has some pooled oil. High volume flush.		42.29733	-85.16992	Y / N
EPA-C-0353	Shoreline & Overbank	SCAT T4 8/28/2010	Flag placed at dried tarry, pool-like area. Flag. MP-14.0 Z-A F-1 KMF Large logs w/oiled debris collected around them (from high current). Staining on trees, tarry vegetation (patches). Zone A also includes a small island just upstrea of the Main St. Lots of frogs and toads (live).					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29754	-85.16856	Y / N

Printed Team Members Name: Dana Strouse (MDNRE), Howard Mann, EPA, Jack Boss, Enbridge
Date: 9/15/10
Comments:
SCC4-24 near bridge ^. Did not see SCC4-1 or SCC4-17 of the Main St

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 13.75-14 Island											
EPA-C-0387	Shoreline	SCAT 08/28/2010	Zone B is entire island. Coated veg on south side of island can cut. workers present cleaning oiled woody debris					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29873	-85.17083	(Y) / N
EPA-C-0388	Shoreline	SCAT 08/28/2010	pooled oil and sheen oil pools from GPs upstream to end of island in small pockets woody debris. workers present cleaning oiled woody debris					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29865	-85.17095	(Y) / N
EPA-C-0093	Shoreline & Overbank	SCAT T1 8/17/2010	10m x 25m area of pooled oil					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29725	-85.16930	(Y) / N

Printed Team Members Name: Dana Strouse (MDNRE), ~~HOWARD PITTAM~~, EPA.
Date: 9/15/10
Comments: EPA-C-0093 island between 2 bridges
4-5 areas of pooled oil in holes on island. Called clean-up crews who came and scraped sediment and placed pads. Sheen remains in Beaver holes. Recommend placing boom in larger hole and continue monitoring area.
Also areas of stained sediment on island remain
EPA-C-0387 Island extends into 14,25 live wood >2" and >4" (dead) removed. Areas of stained sediment remain
Also: Small area of water on island has sheen in bottom sediment.

PO-27 (8/18) Oiled island, pools should be removed 42.297 -85.169 (Y) / N
PO-31 Oil draining to Recon, pooled oile should be removed 42.297 -85.169 (Y) / N
PO-01 (8/15) Oiled island, pools need to be removed 42.297 -85.169 (Y) / N

Did not find flags, but comments are addressed above.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 13.75 **to MP** 14.0 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

14-Sept-10 Enbridge
Signature Doug Deren (date)

9-14-2010 EPA
Signature Eugene Dennis (date)

4. **SCAT Reassessment**

9/15/10 Enbridge
Signature Jack W. Boss (date)

9/15/10 EPA
Signature Howard Phan (date)

9/15/10 MDNRE
Signature Dana Straze (date)

5. **EPA**

9/21/10 EPA Division Supervisor
Signature Jordan Garrard (date)

Appendix E
Photographs

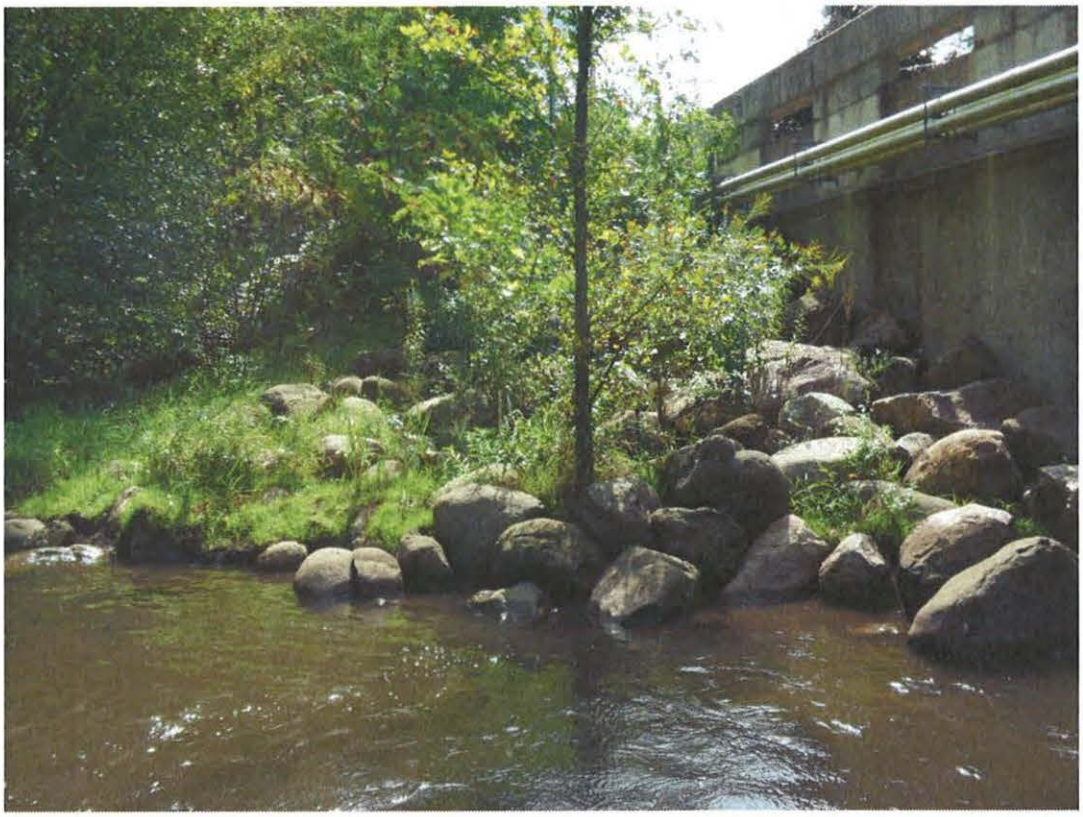


Photo 0659 – Looking south at left descending bank.



Photo 0660 – Looking north at center of channel.

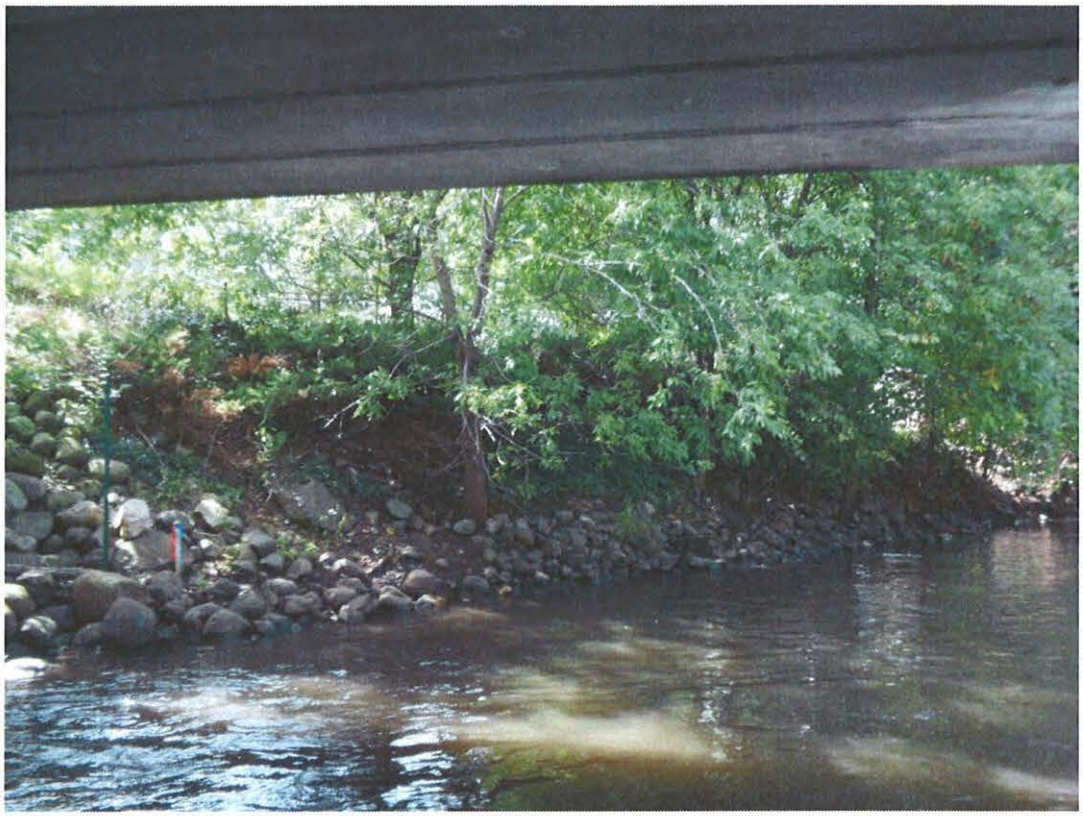


Photo 0661 – Looking southwest at left descending bank, near EPA-C-0091.



Photo 0662 – Looking west at left descending bank, near EPA-C-0351.

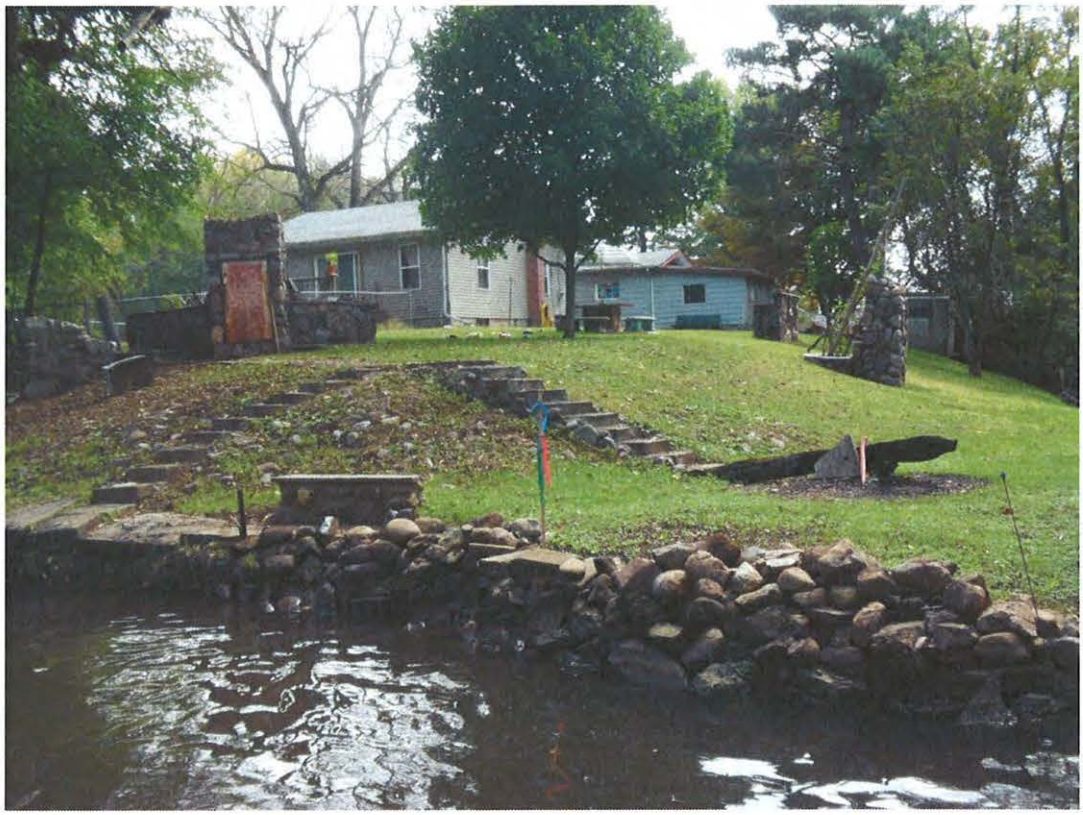


Photo 0663 – Looking southeast at left descending bank, near EPA-C-0351.



Photo 0664 – Looking southwest at left descending bank, near SCC4-1.

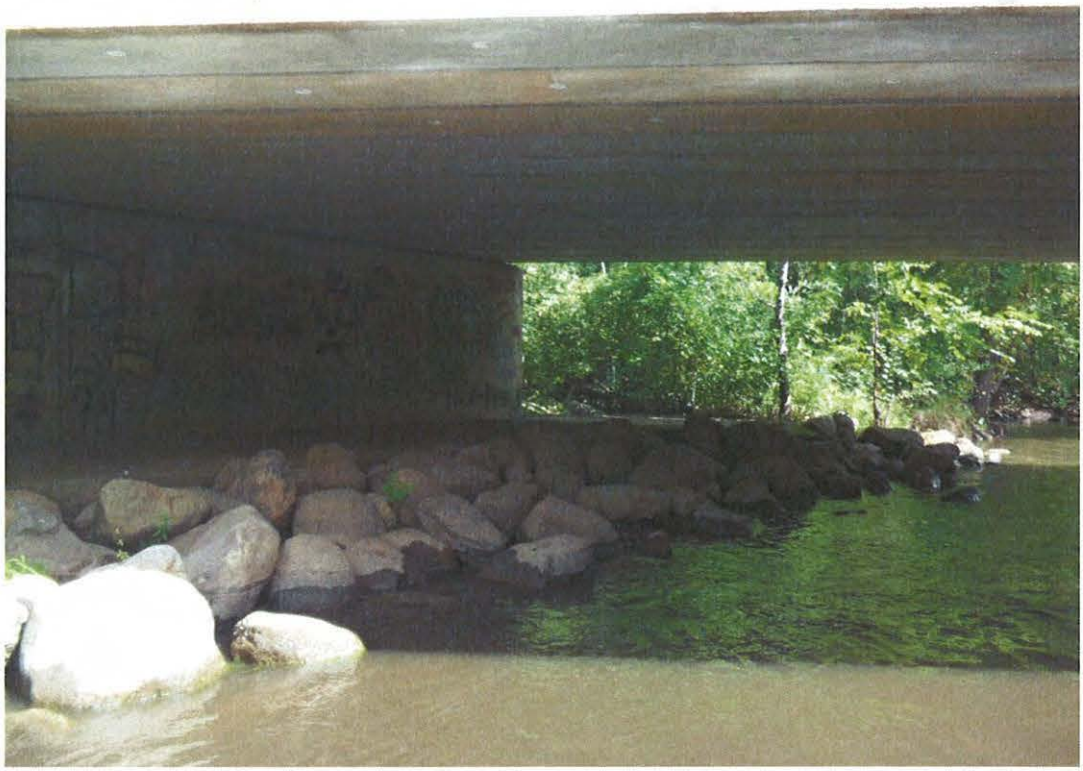


Photo 0665 – Looking northeast at right descending bank.



Photo 0666 – Looking southeast at center of channel.



Photo 0667 – Looking southwest at left descending bank, near SCC4-23.



Photo 0668 – Looking northwest at right overbank bank, near EPA-C-0353.



Photo 0669 – Looking northwest at right overbank bank, near EPA-C-0353.



Photo 0670 – Looking west at right overbank bank, near EPA-C-0353.



Photo 0671 – Looking southwest at right overbank bank, near EPA-C-0353.



Photo 0672 – Looking southwest at right overbank bank, near EPA-C-0353.



Photo 0673 – Looking east at right overbank bank, near EPA-C-0353.



Photo 0674 – Looking southeast at island, near EPA-C-0353 and SCC4-22.



Photo 0675 – Looking southwest at island, near EPA-C-0353 and SCC4-22.



Photo 0676 – Looking east at island, near EPA-C-0353 and SCC4-22.



Photo 0677 – Looking east at island, near EPA-C-0353 and SCC4-22.



Photo 0678 – Looking northeast at island, near EPA-C-0353 and SCC4-22.



Photo 0679 – Looking northwest at island, near EPA-C-0353 and SCC4-22.



Photo 0680 – Looking east at left descending bank.



Photo 0681– Looking east at island, near EPA-C-0387 and SCC4-17.



Photo 0682 – Looking west at island, near EPA-C-0387 and SCC4-17.



Photo 0683 – Looking west at island, near EPA-C-0387 and SCC4-17.



Photo 0684 – Looking west at island, near EPA-C-0093 and EOA-C-0388.



Photo 0685 – Looking north at right descending bank..



Photo 0686 – Looking west at island, near EPA-C-0387 and SCC4-17.



Photo 0687 – Looking northwest at island, near EPA-C-0387 and SCC4-17.



Photo 0688 – Looking south at left descending bank.



Photo 0689 – Looking southwest at left descending bank.



Photo 0690 – Looking northwest at island.



Photo 0691 – Looking southwest at left descending bank.



Photo 0692– Looking northwest at right descending bank, near SCC-24.



Photo 0693– Looking west at left descending bank.



Photo 0694 – Looking north at right overbank.



Photo 0695 – Looking south at right overbank.

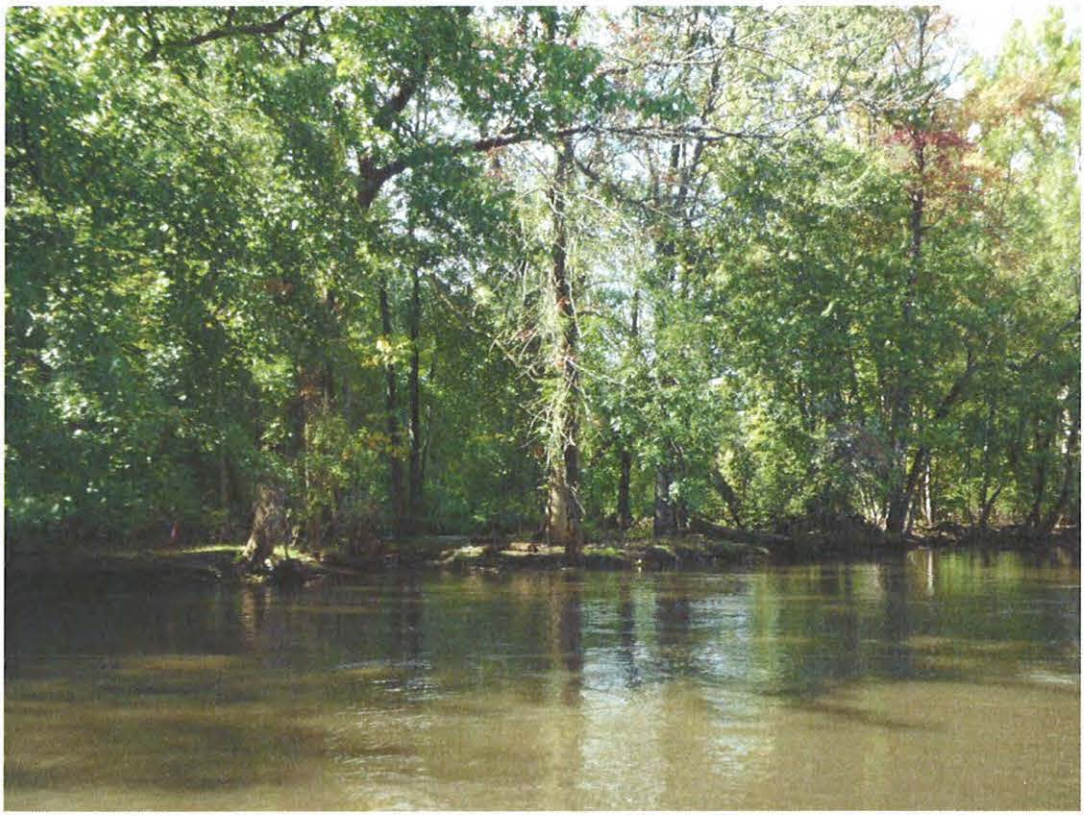


Photo 0696 – Looking west at island, near EPA-C-0387, EPA-C-0388, EPA-C-0392, and EPA-C-0394.



Photo 0697 – Looking southeast at island, near EPA-C-0387, EPA-C-0388, EPA-C-0392, and EPA-C-0394.



Photo 0698 – Looking northwest at island, near EPA-C-0387, EPA-C-0388, EPA-C-0392, and EPA-C-0394.



Photo 0699 – Looking northwest at island, near EPA-C-0387, EPA-C-0388, EPA-C-0392, and EPA-C-0394.



Photo 0700– Looking north at island, near EPA-C-0387, EPA-C-0388, EPA-C-0392, and EPA-C-0394.



Photo 0701– Looking west at left descending bank.



Photo 0702 – Looking northwest at island.

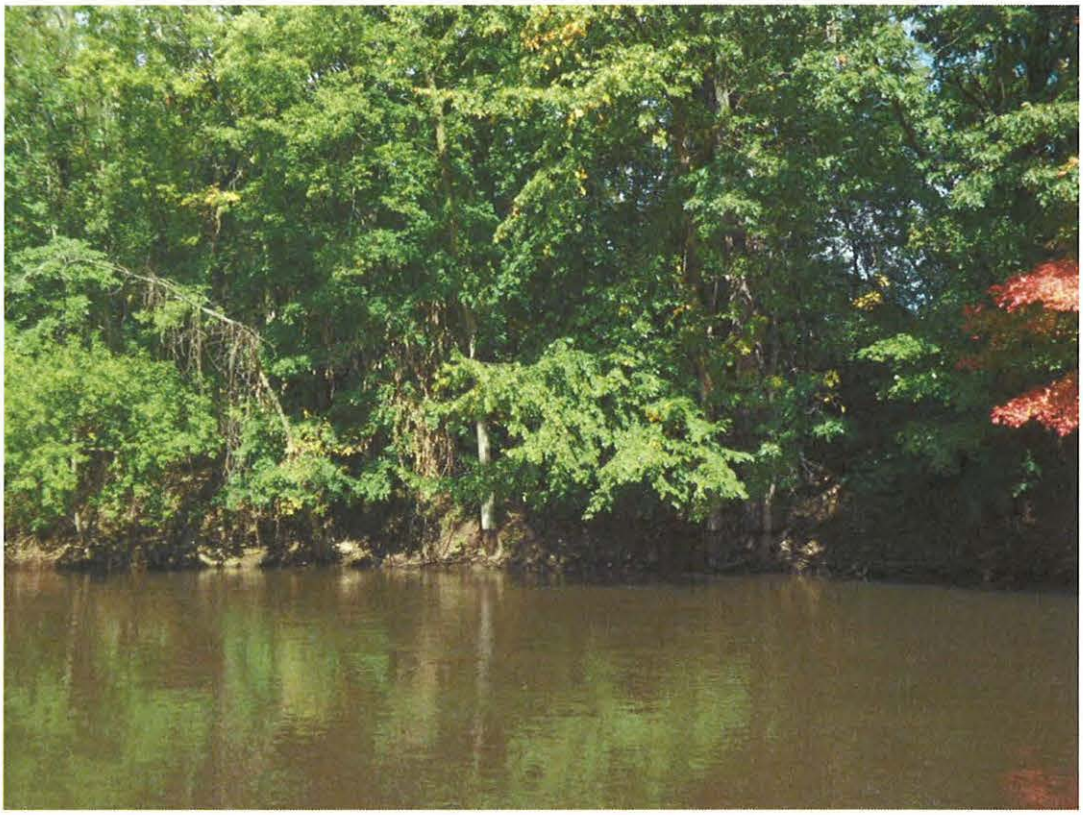


Photo 0703 – Looking southwest at right descending bank.



Photo 0704 – Looking east at right descending bank, near SCC4-21.



Photo 0705 – Looking west at island.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 14.25 – MP 14.00 to 14.25

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 14.25 had heavy oiling with oiled debris and oily vegetation on the left descending bank. An island was present with heavy oiling, pooled oil, oily vegetation and woody debris. The right descending bank had light oiling with oiled vegetation within 10 feet of shoreline from the bridge to MP 14.25. The overbank contained oily vegetation on the left descending bank. A bridge is located in this segment that needed the piers cleaned.

Actions

Free oil was recovered from along the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 14.25 consisted of the following:

- Removal of woody vegetation less than 2" in diameter. However, it was noted that a tree greater than 12" diameter was removed near EPA-C-0387 on the island;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs;
- High volume low pressure flushing for free oil removal with downstream booming, absorbent booms and pads;
- Removal of oiled debris;
- High pressure flushing of man-made structures and/or rocks.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody vegetation on the left descending bank, near EPA-C-0357;
- Oiled woody vegetation on the right descending bank, near EPA-C-0354;

- Oiled woody vegetation on the island, near MP 14.00;
- Soil staining on the island;
- Oiled herbaceous vegetation on left overbank downstream of the Columbia Avenue bridge, near MP 14.00;
- Staining on Columbia Avenue bridge piers on the left and right banks.

Segment 14.25 has reached the operational endpoints for oil recovery per the 5 step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Island/Sandbar
      - Operations Cleanup Recommendation Table
      - Figures (aerial)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Island/Sandbar-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 14-14.25 Left Bank While Looking Downstream										
SCC4-25	Shoreline	Shoreline Assessment	•		•	•	High volume flush		42.30033	-85.17320
EPA-C-0355	Shoreline & Overbank	SCAT T2 08/28/2010	photo 545 is looking downstream from milepost 14.0; photo 539 should be delete. mousse piling up behind snags					Cut oiled vegetation	42.30004	-85.17239
EPA-C-0356	Shoreline & Overbank	SCAT T4 08/30/2010	2-10' x 10' spots. mousse piling up behind snags					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29977	-85.17332
EPA-C-0357	Shoreline	SCAT T4 08/30/2010	mousse is piling up in behind debris snag overhanging veg is oiled kicking up sheen and tar balls when walking; photo 547 is looking upstream from milepost 14.25					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30014	-85.17500
EPA-C-0095	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29968	-85.17113
EPA-C-0096	Shoreline	SCAT T1 8/17/2010	Rainbow sheen in marsh area					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30008	-85.17385





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 14-14.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

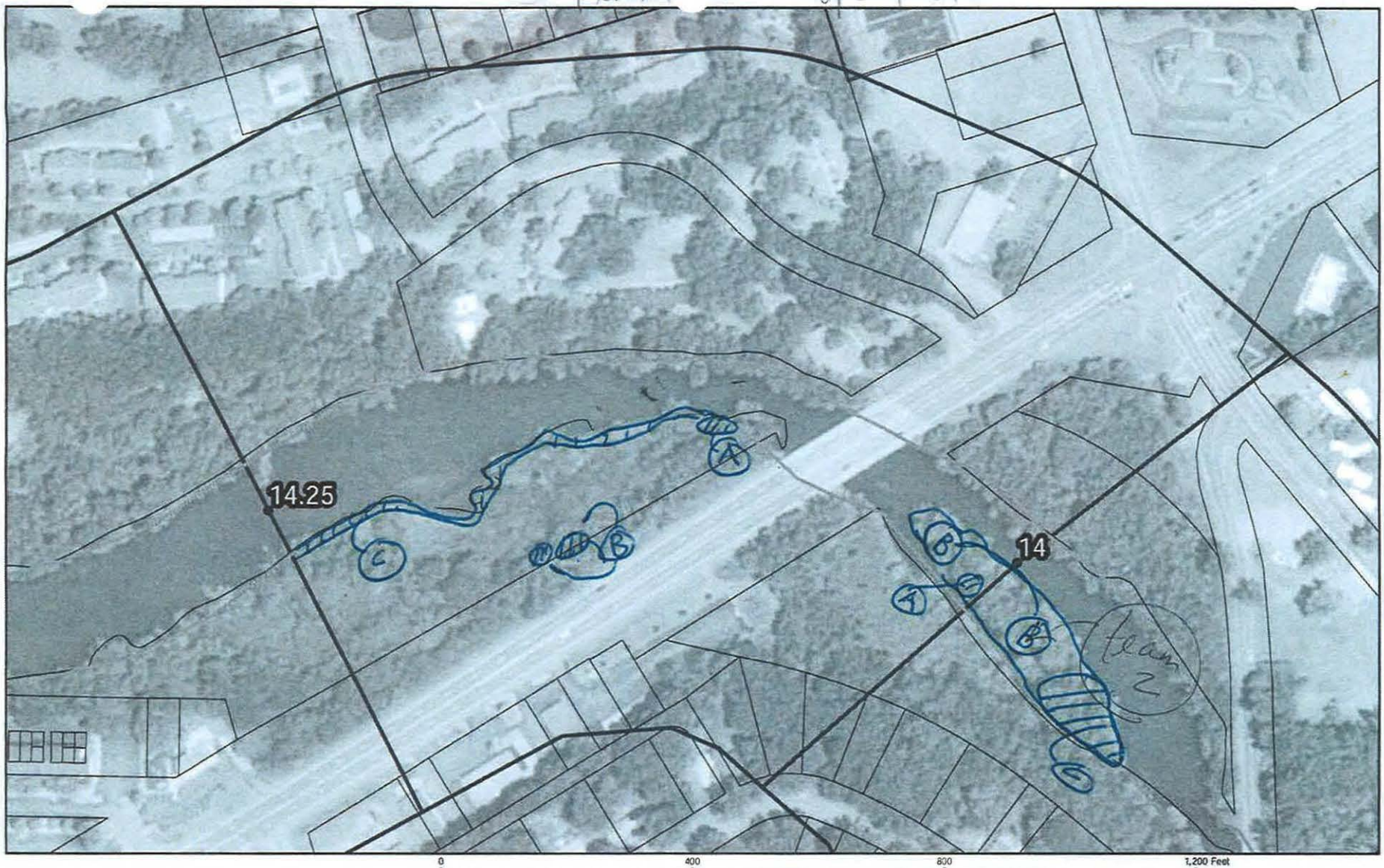
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

team - 8/28/2010



0 400 800 1,200 Feet
0 120 240 360 Meters

QuartermileMarkers
Parcels_1020ftBuffer
Shoreline
River_QuarterMiles
Divisions

14.0 to 14.25

Image: 2009 NAIP

SHEET #: 48

ENTRIX
Down to Earth, Down to Business
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Division C: Mile Marker 14 - 14.25 Left Bank while looking downstream

T2 8/28

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 14-14.25 Island										
EPA-C-0386	Shoreline	SCAT T2 08/28/2010					photo 559 shows pooled oil; photo 560 is looking downstream at island; photo 557 is looking upstream at island. workers present cleaning oiled woody debris.	Remove oiled vegetation leaving roots, absorbant pads	42.29916	-85.17129





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Division C: Mile Marker 14-14.25 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 14-14.25 Right Bank While Looking Downstream										
SCC4-20	Shoreline	Shoreline Assessment	●		●	●	Cut flush and snare. Location on private property.		42.30053	-85.17373
EPA-C-0354	Shoreline	SCAT T3 08/28/2010	One large area was tagged and the gps point is for this location, and it is near MP 14.25. Most of the oiled vegetation is within ten feet shoreline, starting at the bridge and ending MP 14.25.					Remove only oiled vegetation	42.30079	-85.17446
EPA-C-0097	Not Provided	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30062	-85.17453





(River Quarter Miles
! Operational Focus Area
! Pooled Oil

Shoreline Oiling Category
- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

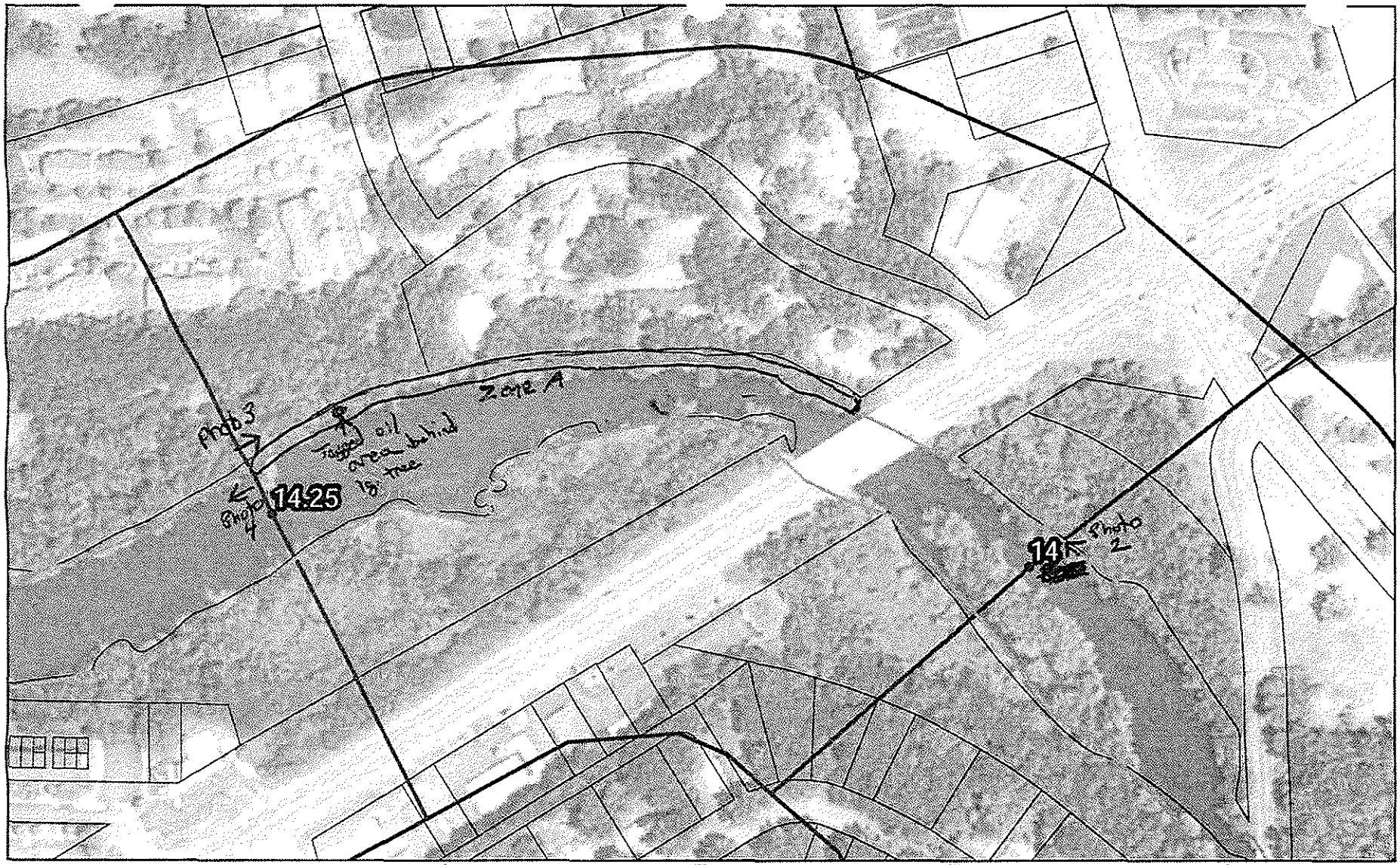
Division C: Mile Marker 14-14.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



Quarter Mile Markers
Parcels_10200 Buffer
Shoreline
River_QuarterMiles
Divisions

Team 3
08/28/2010

14.0 to 14.25

Division C: Mile Marker 14 - 14.25 Right Bank while looking downstream

Image: 2009 NAIP

SHEET # 49

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

T3 8/28

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/12/10 Time: AM / PM

Operations Division: C Segment ID: From 14.00 Start MP to End MP 14.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Jeff Reynolds

Division Supervisor(Contractor): Art Slyton

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT points accepted.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT points accepted.

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT points accepted.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT points accepted.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 09/2/10 Time: AM / PM

Operations Division: C Segment ID: From 14 Start MP to End MP 14.25 Segment Length: 0.25 mile

Bank: (DB / RDB) ☑ Island

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

~~EPA Inspector:~~

Enbridge Inspector: Chad Vile

Division Supervisor(Contractor): Art Slyter

SCAT Reviewed – Description of Clean Up Required

Reviewed SCAT items

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 14-14.25 Right Bank While Looking Downstream											
SCC4-20	Shoreline	Shoreline Assessment	•		•	•	Cut flush and snare. Location on private property.		42.30053	-85.17373	(Y) / N
EPA-C-0354	Shoreline	SCAT T3 08/28/2010	One large area was tagged and the gps point is for this location, and it is near MP 14.25. Most of the oiled vegetation is within ten feet shoreline, starting at the bridge and ending MP 14.25.					Remove only oiled vegetation	42.30079	-85.17446	(Y) / N
EPA-C-0097	Not Provided	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30062	-85.17453	(Y) / N

Printed Team Members Name: Dana Strause MDNRE, Howard Pham, EPA Jack Boss, Enbridge
Date: 9/15/10
Comments:

EPA-C-0095 is on map, but not in comments and did not find flag in field

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 14-14.25 Left Bank While Looking Downstream											
SCC4-25	Shoreline	Shoreline Assessment	•		•	•	High volume flush		42.30033	-85.17320	(Y) / N
EPA-C-0355	Shoreline & Overbank	SCAT T2 08/28/2010	photo 545 is looking downstream from milepost 14.0; photo 539 should be delete. mousse piling up behind snags					Cut oiled vegetation	42.30004	-85.17239	(Y) / N
EPA-C-0356	Shoreline & Overbank	SCAT T4 08/30/2010	2-10' x 10' spots. mousse piling up behind snags					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29977	-85.17332	(Y) / N
EPA-C-0357	Shoreline	SCAT T4 08/30/2010	mousse is piling up in behind debris snag overhanging veg is oiled kicking up sheen and tar balls when walking; photo 547 is looking upstream from milepost 14.25					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30014	-85.17500	(Y) / N
EPA-C-0095	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29968	-85.17113	(Y) / N
EPA-C-0096	Shoreline	SCAT T1 8/17/2010	Rainbow sheen in marsh area					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30008	-85.17385	(Y) / N

Printed Team Members Name: Dana Sitrouse (MDNRE)
Date: 9/15/10
Comments: HOWARD PITTAM, EPA.
Jack Boss, Enbridge

EPA-C-0357 log is acting as natural boom. Relatively new debris w some mousse piling up behind log.

EPA-C-0096 - Actual flag was EPA-C-0097

EPA-C-0356 + SCC4-25. Could not find gps or Scat drawing location of 0356. Walked along shoreline and along highway. Scattered areas of tarry debris, but did not find evidence of 10' x 10' mousse spots

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 14-14.25 Island											
EPA-C-0386	Shoreline	SCAT T2 08/28/2010	photo 559 shows pooled oil; photo 560 is looking downstream at island; photo 557 is looking upstream at island. workers present cleaning oiled woody debris.					Remove oiled vegetation leaving roots, absorbant pads	42.29916	-85.17129	(Y) / N

Printed Team Members Name: Dana Strouse, WDNRE; Howard Paam, EPA. Jack Boss, Enbridge
Date: 9/15/10
Comments:

Large tree >12" dbh removed near EPA-C-0387.
Several areas of stained sediment remain.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION Operations Division: C Segment ID: From MP 14.0 to MP 14.25 Segment Length: 0.25 mile

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature DOUG DEREN 14-Sept-10 (date) Enbridge

Signature Eugene Dennis 9-14-2010 (date) EPA

4. **SCAT Reassessment**

Signature Jack W. Boss 9/15/10 (date) Enbridge

Signature HOWARD PHAM 9/15/10 (date) EPA

Signature Dana Strase 9/15/10 (date) MDNRE

5. **EPA**

Signature JASON MUSANTE 9.19.10 (date) EPA Division Supervisor

Appendix E
Photographs



Photo 0706 – Looking north at island.



Photo 0707 – Looking northwest at left descending bank.



Photo 0708 – Looking north at island.



Photo 0709 – Looking northwest at left descending bank.



Photo 0710 – Looking southeast at island, near EPA-C-0386.



Photo 0711 – Looking northwest at island, near EPA-C-0386.



Photo 0712 – Looking southeast at right descending bank.



Photo 0713 – Looking east at right descending bank, near EPA-C-0095.



Photo 0714 – Looking northwest at left descending bank.



Photo 0715 – Looking northeast at right descending bank.



Photo 0716 – Looking northwest at left overbank, near EPA-C-0355.



Photo 0717 – Looking northwest at left overbank, near EPA-C-0355.



Photo 0718 – Looking southwest at left overbank, near EPA-C-0355.



Photo 0719 – Looking southeast at left overbank, near EPA-C-0355.



Photo 0720 – Looking southwest at left overbank, near EPA-C-0355.



Photo 0721 – Looking southeast at right descending bank.



Photo 0722 – Looking northwest at right descending bank.

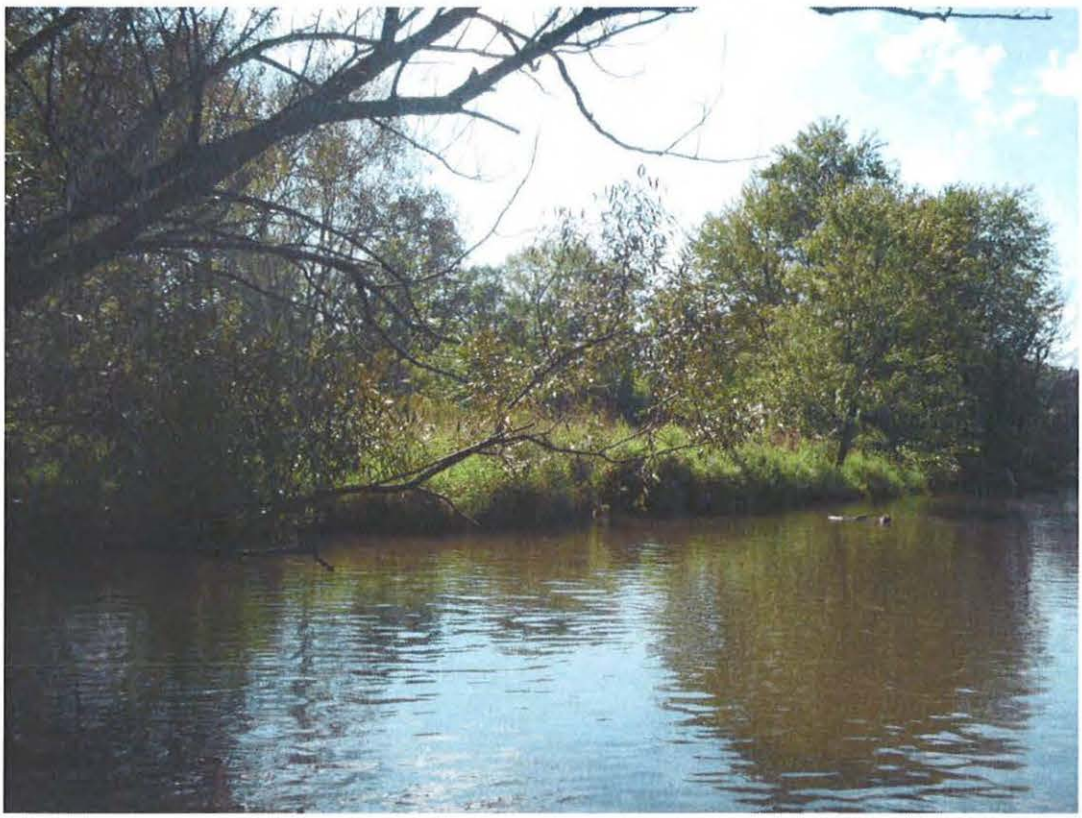


Photo 0723 – Looking west at left descending bank.



Photo 0724 – Looking northwest at left descending bank.



Photo 0725 – Looking east at right descending bank.



Photo 0726 – Looking northeast at right descending bank, near SCC4-20.



Photo 0727 – Looking north at right descending bank.



Photo 0728 – Looking east at left descending bank, near EPA-C-0097.



Photo 0729 – Looking southeast at left descending bank, near EPA-C-0097.



Photo 0730 – Looking south at left descending bank, near EPA-C-0097.



Photo 0731 – Looking west at right descending bank, near EPA-C-0096 and EPA-C-0354.



Photo 0732 – Looking north at right descending bank, near EPA-C-0096 and EPA-C-0354.



Photo 0733 – Looking northeast at right descending bank, near EPA-C-0096 and EPA-C-0354.



Photo 0734 – Looking west at right descending bank, near EPA-C-0096 and EPA-C-0354.



Photo 0735 – Looking east at right descending bank, near EPA-C-0096 and EPA-C-0354.



Photo 0736 – Looking south at left descending bank, near EPA-C-0357.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 14.50 – MP 14.25 to 14.50

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 14.50 had heavy oiling, oiled debris and heavily oiled soil on the left descending bank. There are no islands present in this segment. Light oiling was observed on the right descending bank. The overbank contained no areas requiring clean-up.

Actions

The shoreline clean-up activities within Segment 3.5 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs;
- Removal of oiled debris.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled logs with oily debris and tar on the left descending bank near EPA-C-0360;
- Tar deposits near base of tree on left descending bank near EPA-C-0098.

Segment 14.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

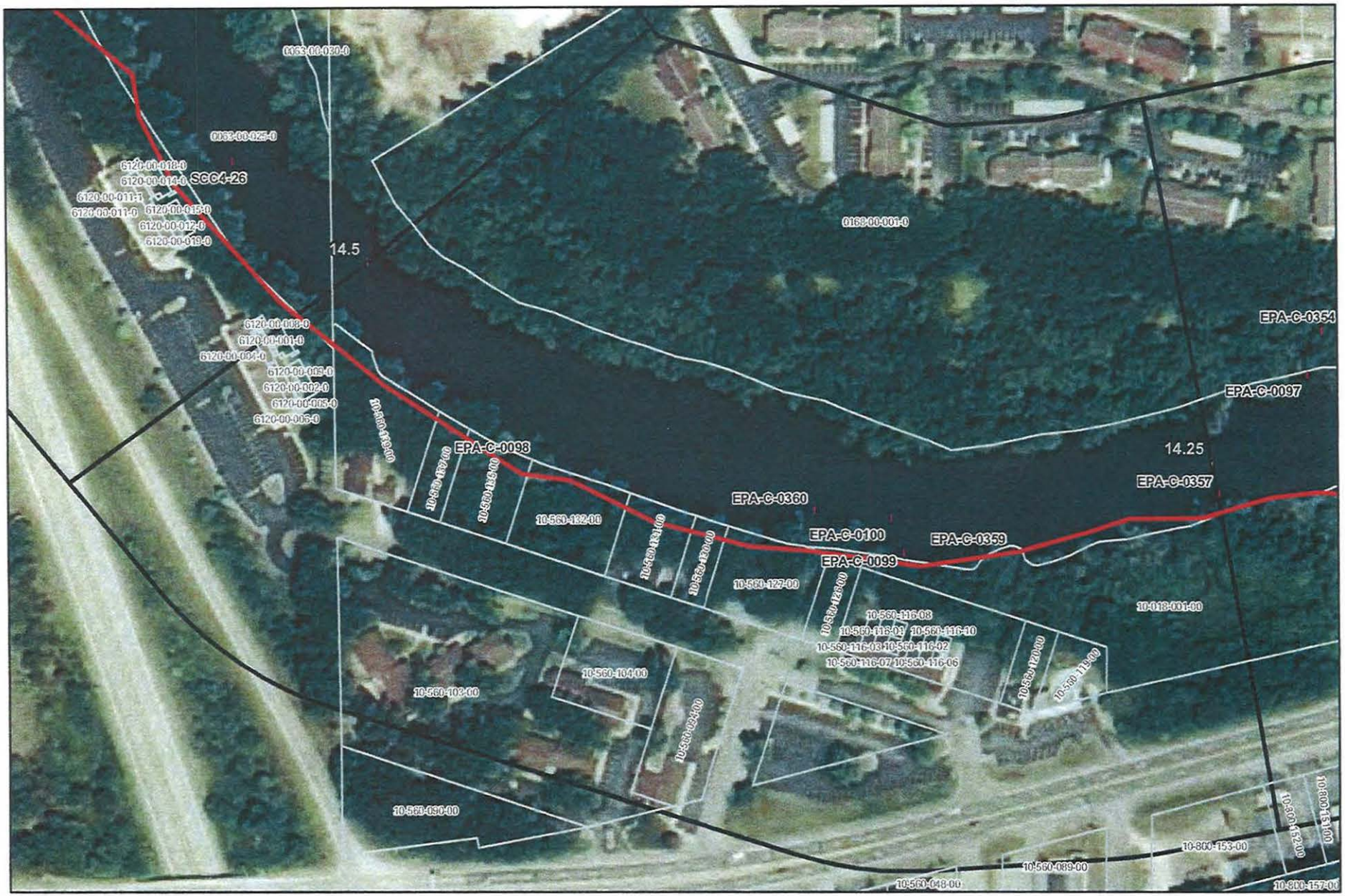
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

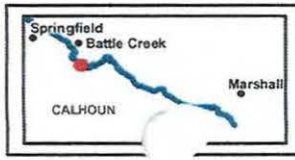
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release *...nt - Kalamazoo River Oil Spill*

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 14.25-14.5 Left Bank While Looking Downstream										
EPA-C-0359	Shoreline	SCAT T2 08/28/2010	sheen in water possible mousse; photo 549 shows coated debris; photo 548 is looking downstream from milepost 14.25					Cub and bag limbs, remove oiled vegetation leaving roots, remove oiled debris	42.29991	-85.17610
EPA-C-0360	Shoreline	SCAT T2 08/28/2010	multiple snags w/ oily debris built up sheen on water workers present in this section; photo 551 is looking downstream from milepost 14.5					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30006	-85.17716
EPA-C-0098	Main Channel	SCAT T1 8/14/2010	WP-80 - 1/2 sunk canoe - mousse in canoe at shoreline					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30037	-85.17912
EPA-C-0099	Main Channel	SCAT T1 8/17/2010	Flat grassy/mud/flood plain - penetration 50 m. Sediments heavily oiled coated. WP of 142 mybe not be correct, but it follows location of WP 12.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29990	-85.17668





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 14.25-14.5
Left Bank While Looking Downstream

Enbridge F… elease Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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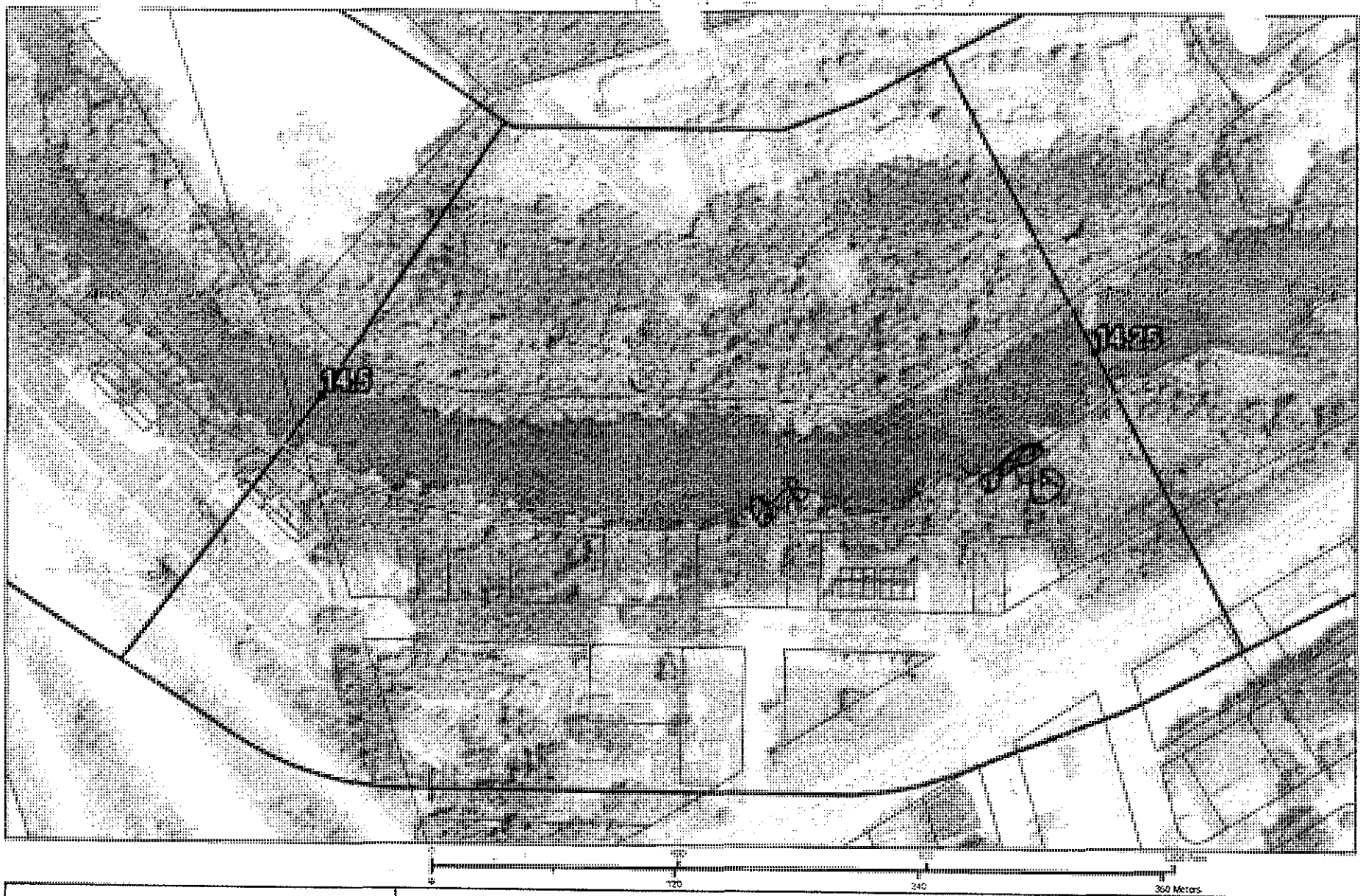
Coor… m: NAD 1983 State Plan… South Feet



14.25 to 14.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET 1 of 46

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Down to Earth. Down to Business.

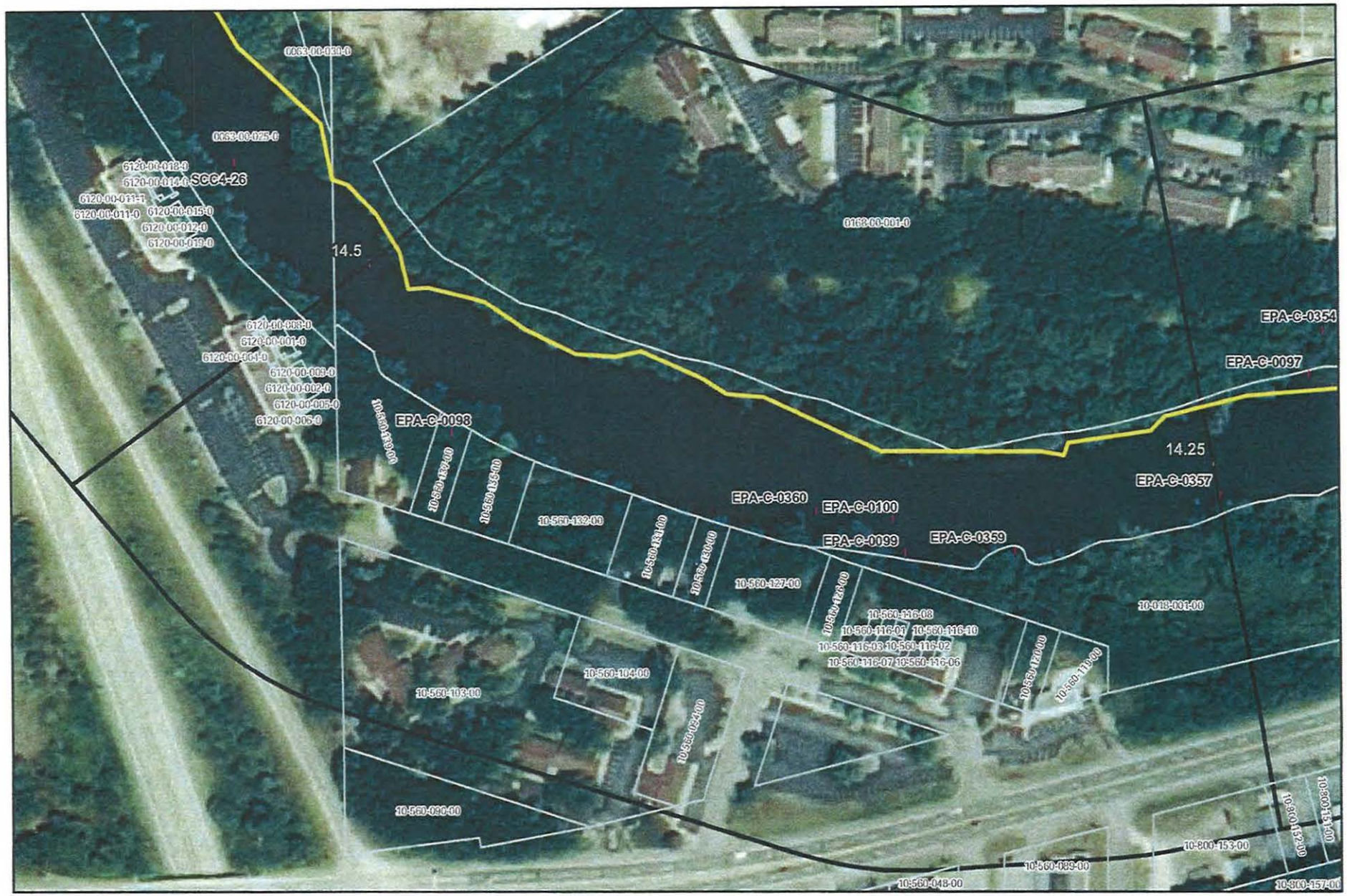
www.entrix.com

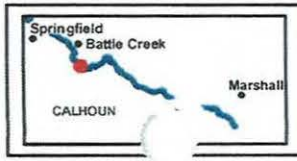
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Enbridge Pipeline Release ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 14.25-14.5 Right Bank While Looking Downstream										
EPA-C-0100	Not Provided	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30003	-85.17675





(River Quarter Miles
! Operational Focus Area
. Pooled Oil

Shoreline Oiling Category
- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Division C: Mile Marker 14.25-14.5 Right Bank While Looking Downstream

Enbridge [illegible] Release Incident - Kalamazoo River Oil Spill

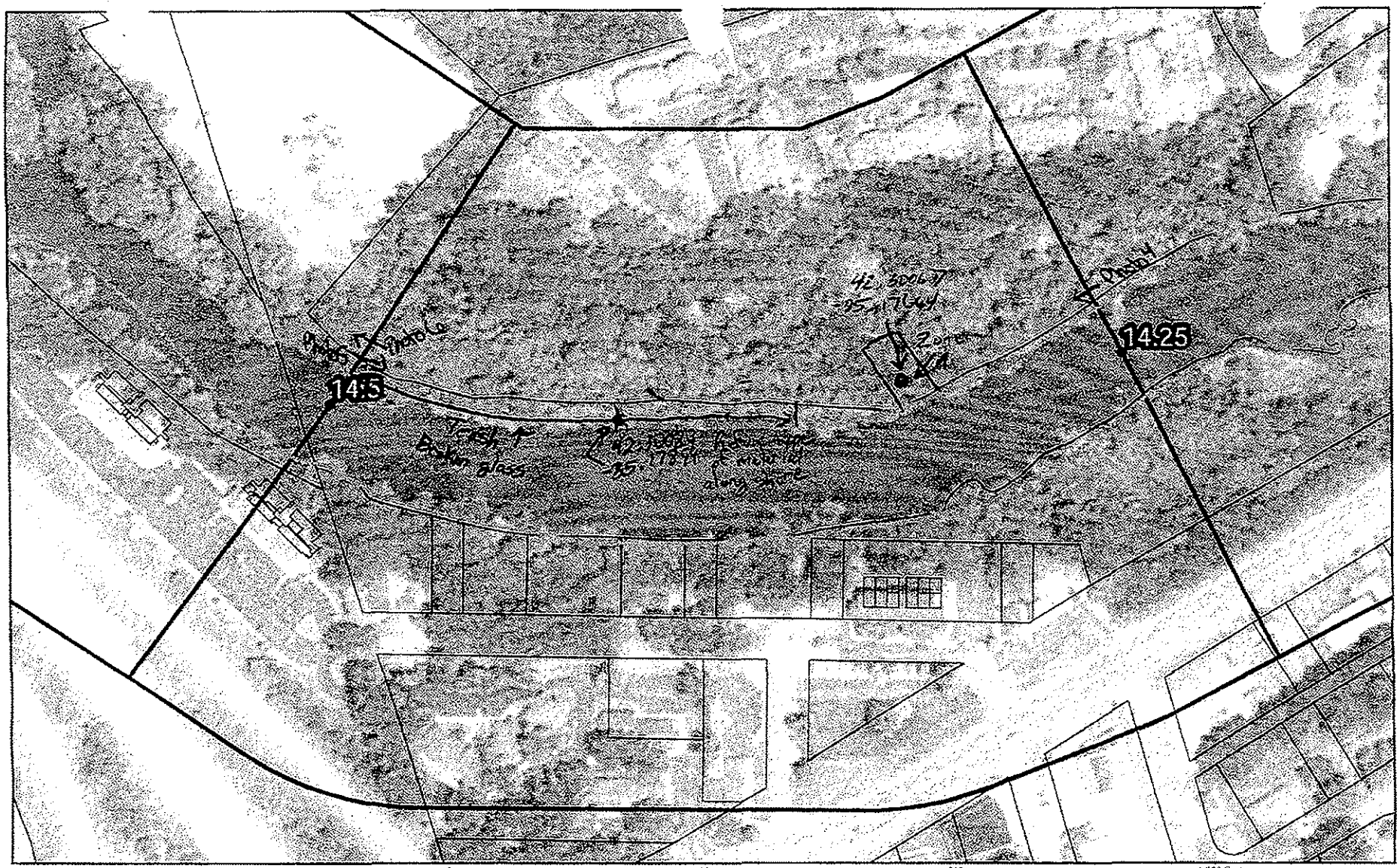
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coor[illegible]em: NAD 1983 State Plan[illegible], South Feet



Team 3
08/28/2010

14.25 to 14.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

T3 8/28

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/12/10 Time: AM / PM

Operations Division: C Segment ID: From 14.25 Start MP to End MP 14.50 Segment Length: 0.25 mile

Bank: LDB / RDB ☑ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Jeff Reynolds

Division Supervisor(Contractor): Art Slaytor

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points located & flagged and cleared.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT points located & flagged and cleared

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT Points located & flagged and cleared.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

all SCAT Points located & flagged and cleared.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 09/2/10 **Time: AM / PM**

Operations Division: _____ **Segment ID: From** 14.25 **Start MP to End MP** 14.5 **Segment Length: 0.25 mile**

Bank: (LDB / RDB) ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

~~**EPA Inspector:**~~

Enbridge Inspector: Chad Vife

Division Supervisor(Contractor): Art Slaytor

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ SCAT Requirements/Clean Up Complete

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 14.25-14.5 Left Bank While Looking Downstream											
EPA-C-0359	Shoreline	SCAT T2 08/28/2010	sheen in water possible mousse; photo 549 shows coated debris; photo 548 is looking downstream from milepost 14.25					Cub and bag limbs, remove oiled vegetation leaving roots, remove oiled debris	42.29991	-85.17610	(Y) / N
EPA-C-0360	Shoreline	SCAT T2 08/28/2010	multiple snags w/ oily debris built up sheen on water workers present in this section; photo 551 is looking downstream from milepost 14.5					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30006	-85.17716	(Y) / N
EPA-C-0098	Main Channel	SCAT T1 8/14/2010	WP-80 - 1/2 sunk canoe - mousse in canoe at shoreline					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30037	-85.17912	(Y) / N
EPA-C-0099	Main Channel	SCAT T1 8/17/2010	Flat grassy/mud/flood plain - penetration 50 m. Sediments heavily oiled coated. WP of 142 mybe not be correct, but it follows location of WP 12.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.29990	-85.17668	(Y) / N

Printed Team Members Name: Dana Strouse (MDNRE), HOWARD PHAM, EPA Jack Boss, Enbridge

Date: 9/15/10

Comments:

EPA-C-0098 – Did not see 1/2 sunk canoe. It could have been removed? Tar deposits in bark of tree. Also tree is acting like boom & trapping new debris w/ some oiling.

EPA-C-360 – Log w/ oily debris / tar. Log is > 4"

EPA-C-099 and 0100. Pom Poms in area tar balls and sheen visible. Cleanup crew came and placed new poms. Recommend maintaing poms and boom in area.

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 14.25-14.5 Right Bank While Looking Downstream											
EPA-C-0100	Not Provided	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30003	-85.17675	Y / N

Printed Team Members Name: Dana Strause (ADAMS), HOWARD PHAM, EPA. Jack Boss, Enbridge
Date: 9/15/10
Comments:

Nearly entire segment is old dump site. Lots of large holes, broken glass everywhere. Some holes have water w/ sheen. Also patches of tarry vegetation throughout. Across from EPA-C-360. Dangerous to walk due to holes and broken glass. Would be difficult to clean due to broken glass.

Zone A reflects refuse material along shoreline, should be removed if coated in oil Y / N

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 14.25 **to MP** 14.5 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature DOUG DOREN (date) 14-Sept-10 Enbridge

Signature Eugene Dennis, OSC (date) 9-14-2010 EPA

4. **SCAT Reassessment**

Signature Jack W. Boss (date) 9/15/10 Enbridge

Signature HOWARD PRATT (date) 9/15/10 EPA

Signature Dana Strouse (date) 9/15/10 MDNRE

5. **EPA**

Signature Jordan Howard (date) 9/21/10 EPA Division Supervisor

Appendix E
Photographs



Photo 0737 – Looking northwest at right overbank.



Photo 0738 – Looking southeast at left overbank, near EPA-C-0099.



Photo 0739 – Looking south at left overbank, near EPA-C-0099.



Photo 0740 – Looking west at left descending bank.



Photo 0741– Looking south at left descending bank.

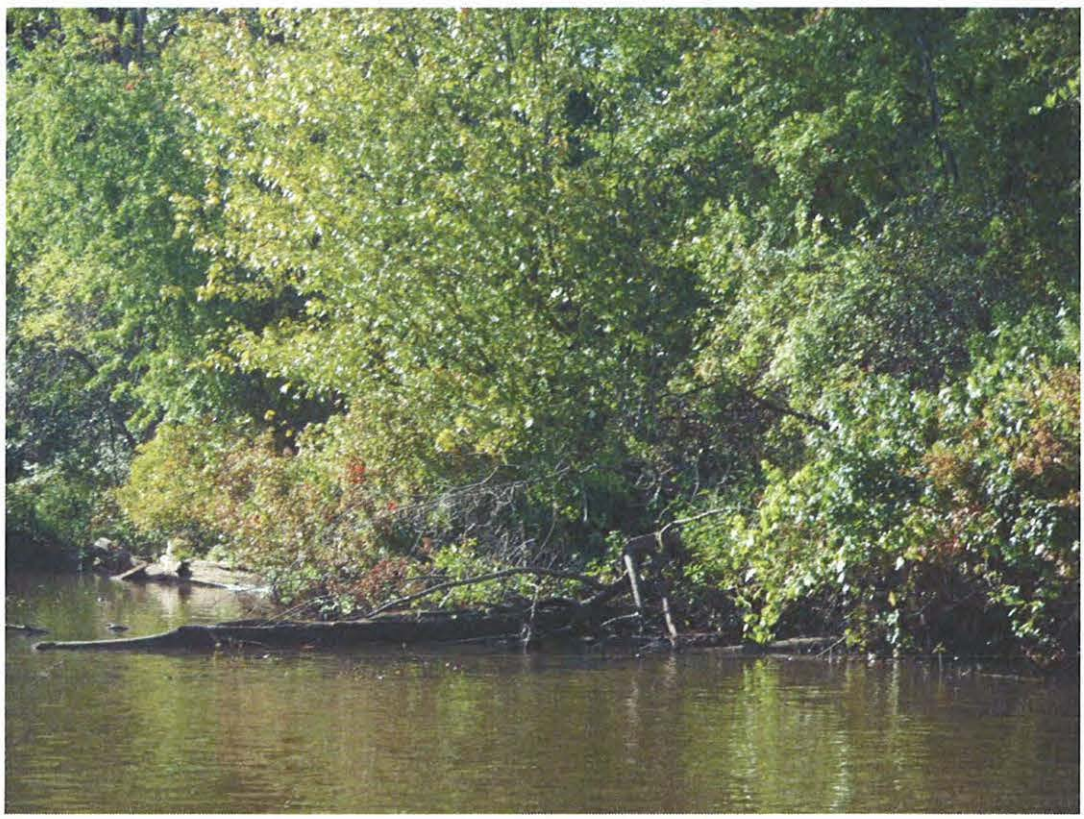


Photo 0742 – Looking north at right descending bank.



Photo 0743 – Looking southeast at left descending bank, near EPA-C-0359.



Photo 0744 – Looking southwest at left descending bank, near EPA-C-0100.



Photo 0745 – Looking southeast at left descending bank, near EPA-C-0100.

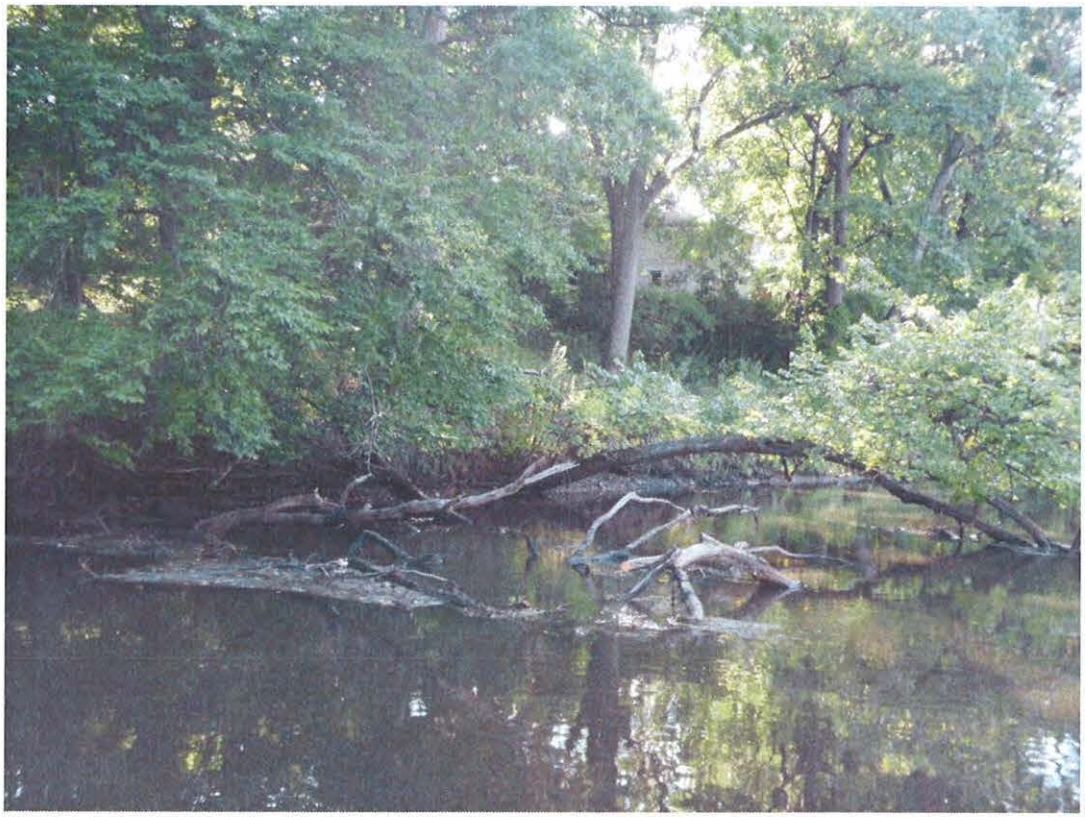


Photo 0746 – Looking southwest at left descending bank, near EPA-C-0360.



Photo 0747 – Looking south at left descending bank, near EPA-C-0360.



Photo 0748 – Looking southeast at left descending bank.



Photo 0749 – Looking southwest at left descending bank, near EPA-C-0098.



Photo 0750 – Looking southwest at left descending bank, near EPA-C-0098.



Photo 0751 – Looking southeast at left descending bank, near EPA-C-0098



Photo 0752 – Looking southwest at left descending bank.



Photo 0753 – Looking west at left descending bank.



Photo 0754 – Looking north at right descending bank.



Photo 0755– Looking north at right descending bank.



Photo 0756 – Looking northwest at right descending bank.



Photo 0757 – Looking northwest at right descending bank.



Photo 0758 – Looking northwest at right descending bank.



Photo 0759 – Looking northwest at right descending bank.



Photo 0760 – Looking northwest at right descending bank.

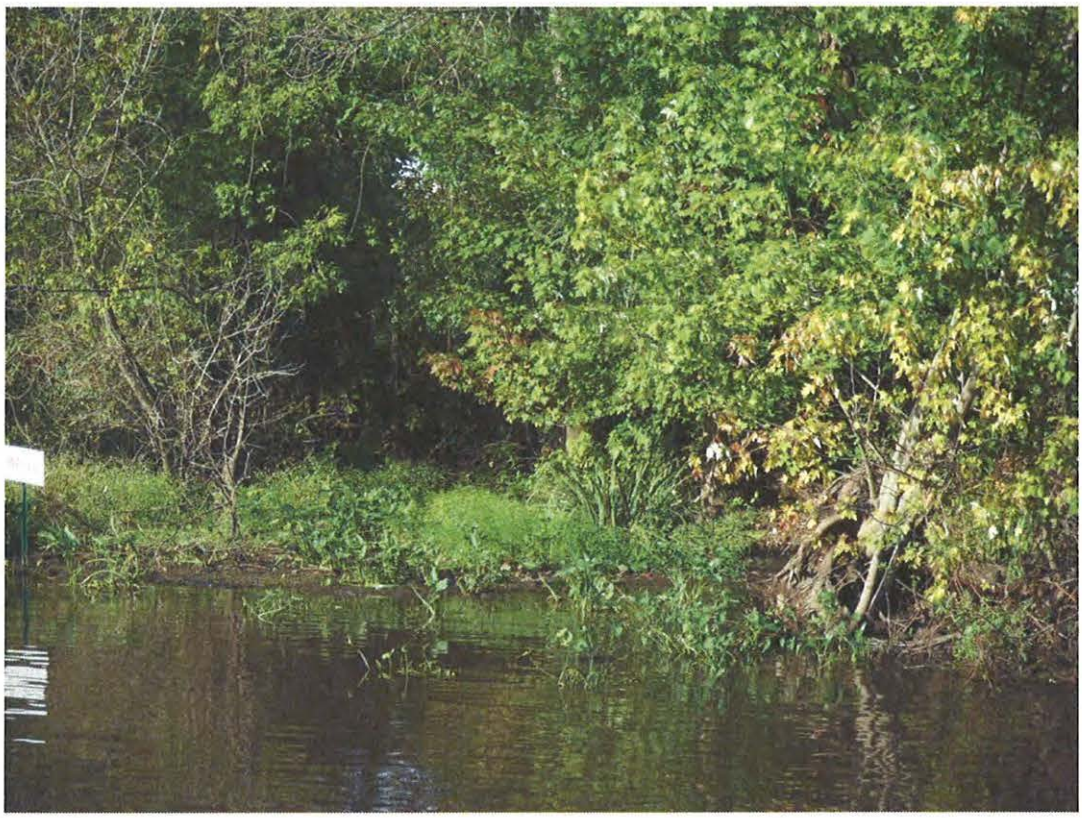


Photo 0761 – Looking north at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 14.75 – MP 14.5 to 14.75

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 14.75 had heavy levels of oil staining on the left descending bank. Pooled oil/tar, oiled debris and vegetation were observed along the bank as well as sheen on the river. During re-assessment, saturated soil and pooled oil were noted in sensitive wetland areas along the left descending bank. SCAT team suggests care be taken not to further destroy these wetlands. Small tarry oil pools ranging from 1" to 3" in diameter were observed primarily on the upstream tip of the island in this section. Piles of oily brush/limbs, saturated soil and sheen were observed during re-assessment on the island. There were light levels of staining along the right descending bank. Oiled herbaceous vegetation with small pockets of oil was observed southeast of the island's tip on right descending bank.

Actions

The shoreline clean-up activities within Segment 14.75 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Vegetation removal, leaving roots intact and woody plants greater than 2" in diameter;
- Removal of oiled debris larger than 4" in diameter;
- Manual removal/scraping of contaminated soil;
- Manual removal of oiled debris;
- Mobilization and capture of oil with boom or sorbent material before and during moving debris;
- Pooled oil removal.

Outcome

During the SCAT re-assessment, 3 areas of tarry debris/sediment were marked with caution tape and sheen was observed on the river. Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Sheen areas and saturated soils remain and need to be addressed during ongoing Operation and Maintenance.
- Oiled woody vegetation remains along the left descending bank and on the island (zone A).
- Piles of oily brush/limbs need to be removed before area is cleared.
- Absorbent boom and pom-poms should be placed along 30' shoreline of the left descending bank to prevent sheen accumulation in river.

Segment 14.75 has reached the operational endpoint for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

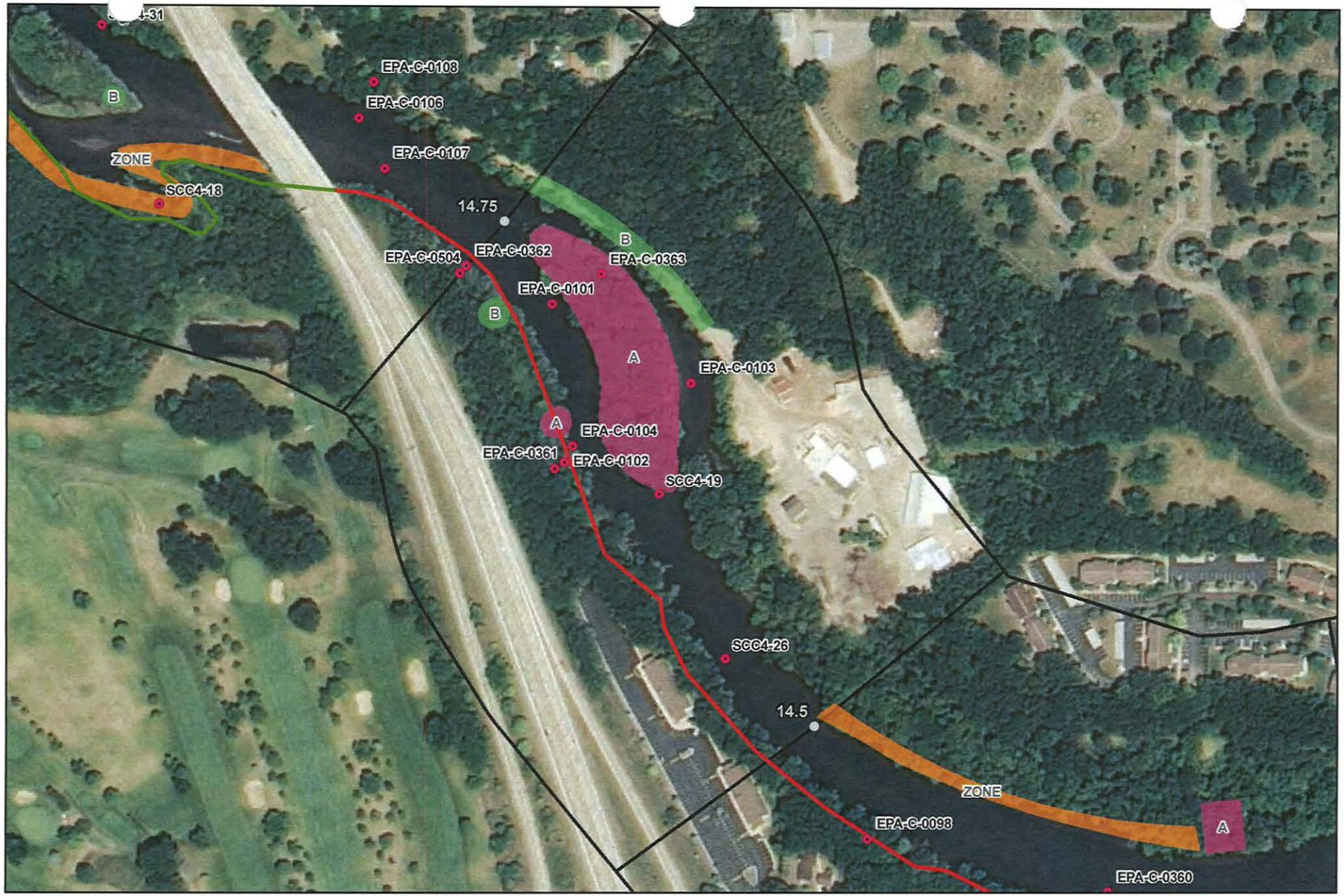
- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... | Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 14.5-14.75 Left Bank While Looking Downstream										
SCC4-26	Shoreline	Shoreline Assessment	•	•	•	•	Logjam with derbis. Small amount of pooled oil. Flush to C5.		42.30143	-85.18028
EPA-C-0361	Shoreline & Overbank	SCAT T2 08/28/2010	site was already flagged w/ yellow and black flags; photo 552 is looking downstream from milepost 14.5					sheen in river At all snags oiled debris and veg piling up behind and should be removed. Absorbant pad, shovel, minimize entry (to prevent unnecessary substrate contamination).	42.30256	-85.18168
EPA-C-0362	Shoreline & Overbank	SCAT T2 08/28/2010	3 isolated spots 1 foot by I foot; photo 554 shows pooled oil; photo 556 is looking upstream from milepost 14.75					sheen in river At all snags oiled debris and veg piling up behind and should be removed	42.30377	-85.18241
EPA-C-0101	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30355	-85.18172
EPA-C-0102	Not Provided	SCAT T1 8/17/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30260	-85.18160
EPA-C-0405	Shoreline & Overbank	SCAT T1 08/30/2010	pic 1012554 small pool of oil/tar near upstream of mp14.75. Technically this is in segment 14.75 and it has been flagged with yellow caution tape. Picture SAM0036 is mile point 14.75. Picture SAM0037 is mile point 15.0 continued 8/30/10 10:45 am. 8/30/10 AM team GV, MK, CC reported 5 oily female mallard ducks to the wildlife hotline. Wildlife rep said they were aware of the group and were going to try trapping them today. LDB wetalnds and upland surveyed; no oil					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30373	-85.18246





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

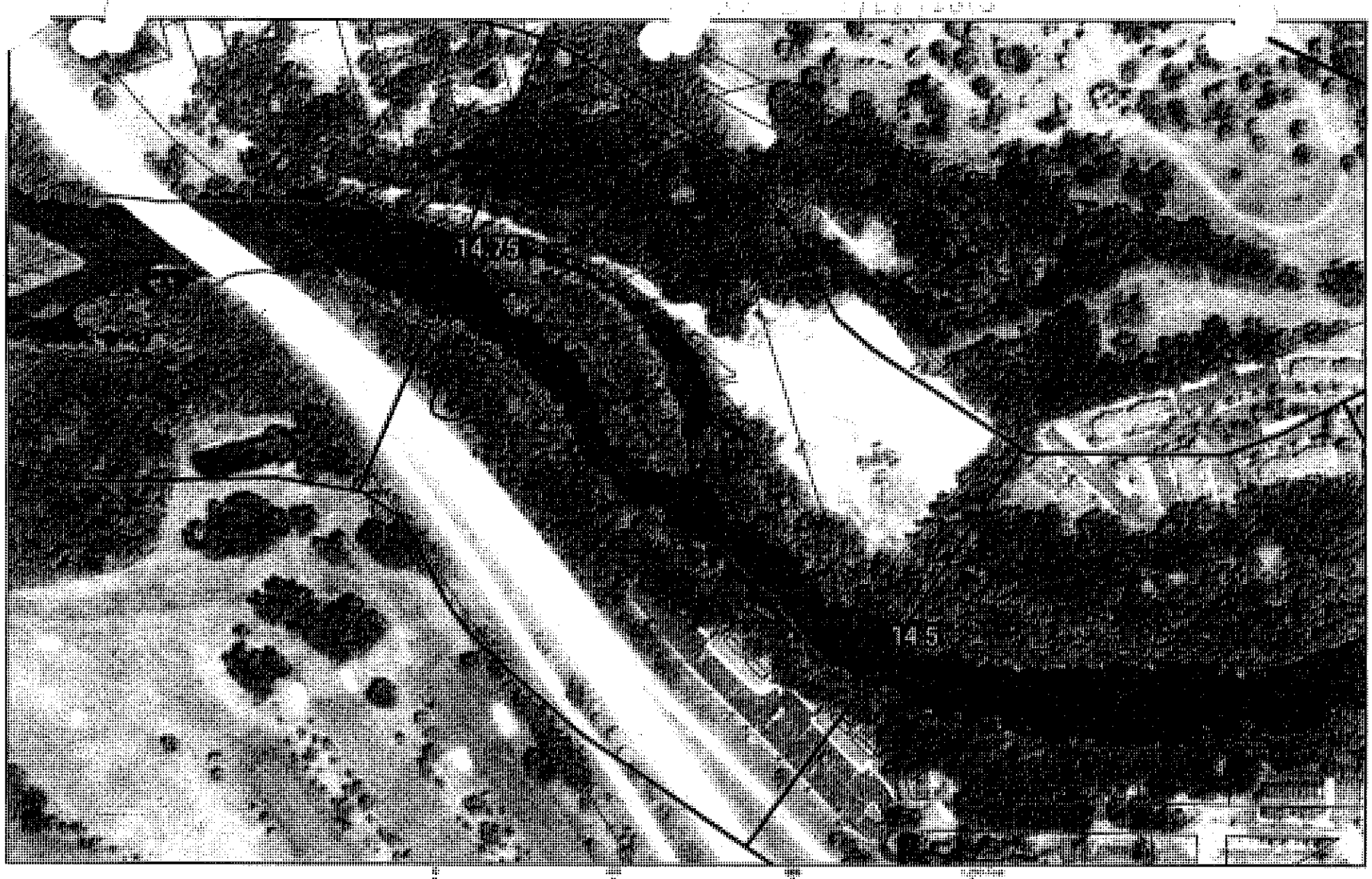
Division C: Mile Marker 14.5-14.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



14.5 to 14.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

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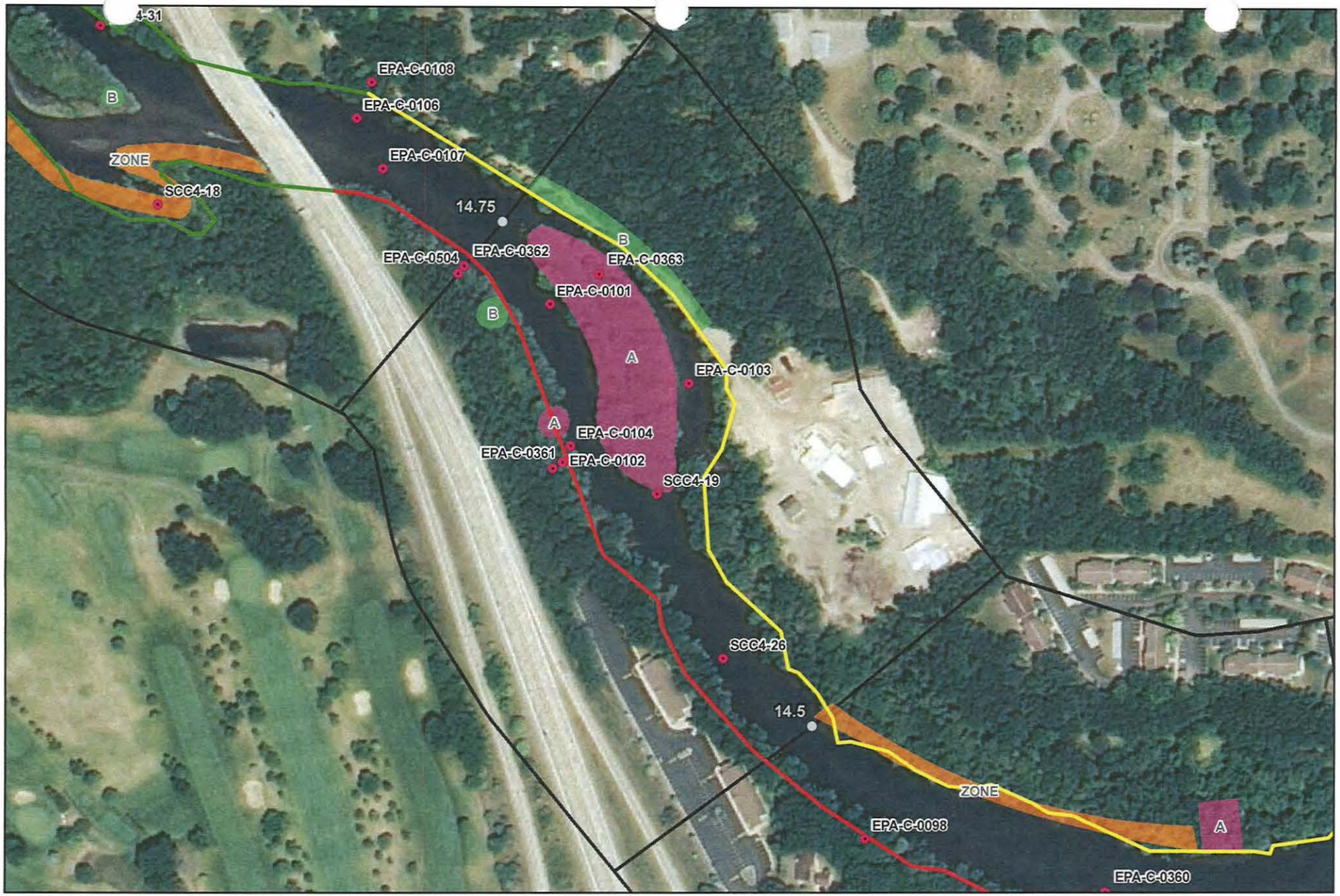
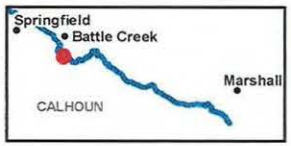
Enbridge Pipeline Release In Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 14.5-14.75 Island										
EPA-C-0363	Shoreline & Overbank	SCAT T4 08/28/2010	Zone A consists of an island that has sensitive emergent wetlands. Generally, there are small tarry oil pools ranging from 1-3' in daim distributed primarily on the upstream portion of tip of land. These tarry pools have already been flagged w/yellow. One tagged pool has a sorbant rag in it. A high priority pool was tagged by the edge of the arrowheads on the KR side if the island.(Flag ID #14.75Z-A-F-2 KMF Evidence of several instances of tree limbs cut which were obviously >2" in diam. Saw one live snake; - Gardner? Black w/yellow stripe; approx. 1.75' long.						High Priority cleanup, numerous (>10 marked terry pools of thick tar and NAPL, Remove contaminated and impacted soils immeditaly	42.30373	-85.18132





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

Division C: Mile Marker 14.5-14.75 Island

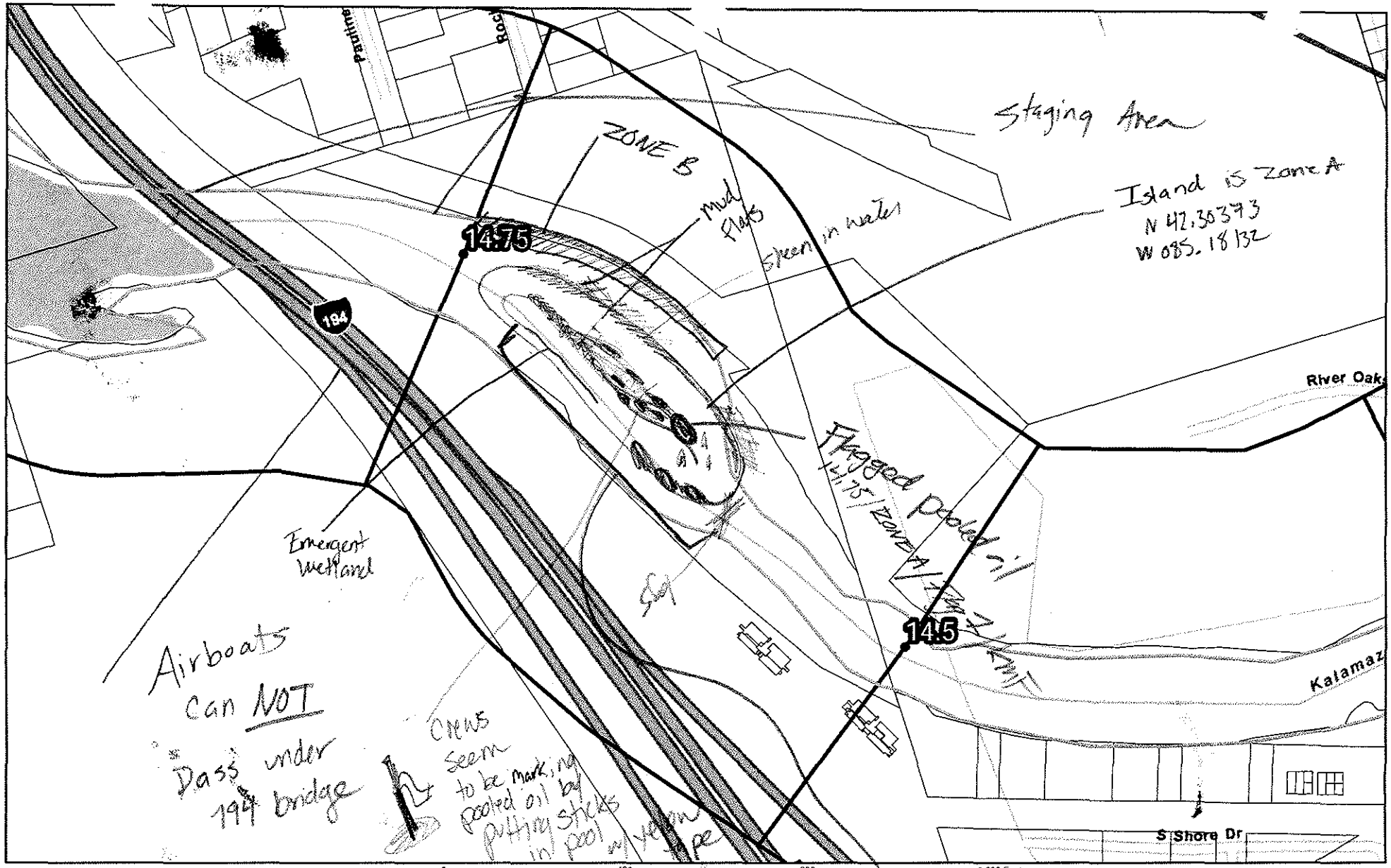
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

M.P. – 14.75 – Island



QuartermileMarkers
Parcels_10200ftBuffer
Shoreline
River_QuarterMiles
Divisions

Team 4 8/28/10

14.5 to 14.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

This side of island has been [illegible]

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

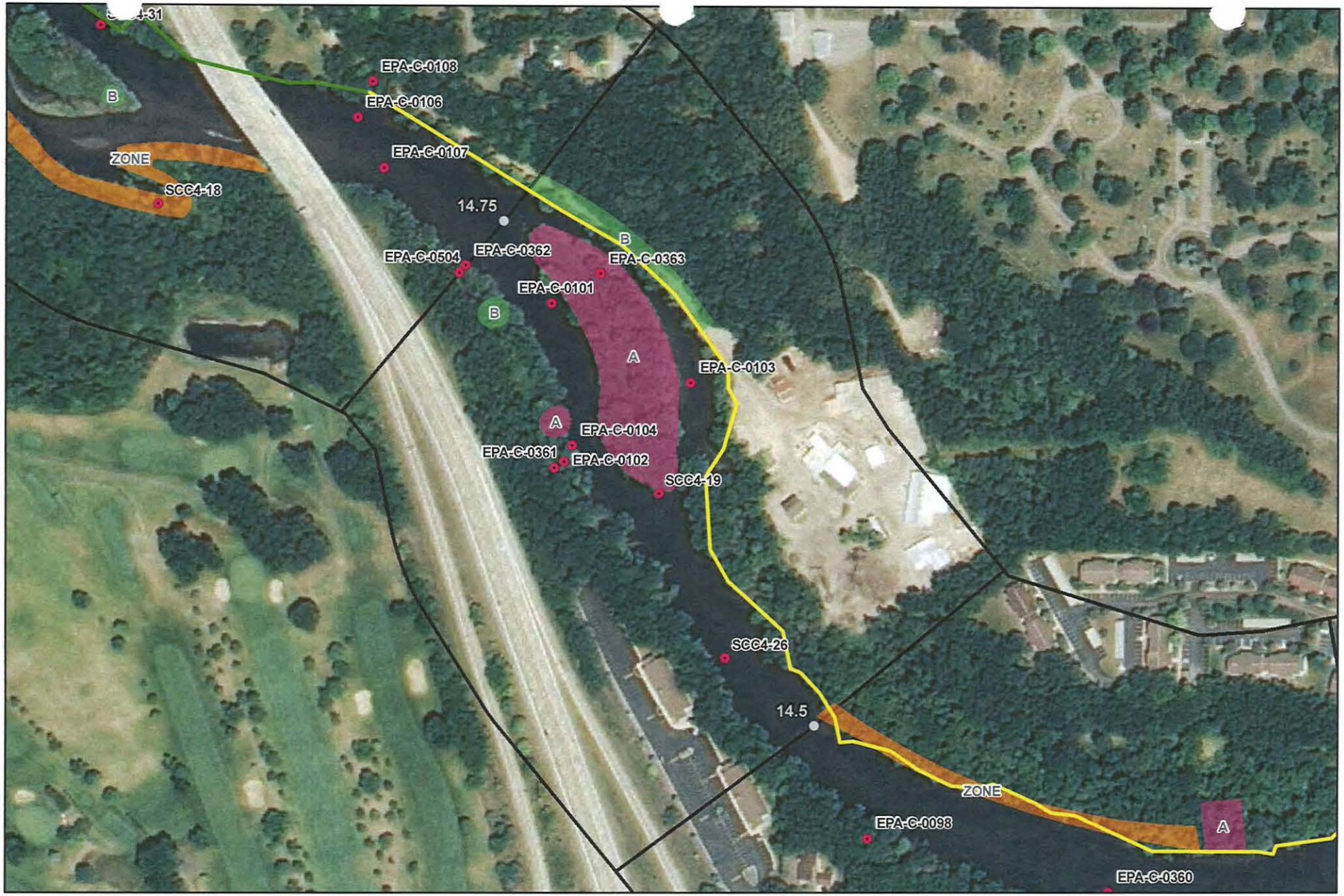
Coordinate System: NAD 1983 STATE PLANE MICHIGAN [illegible]TH FEET

Team 2

Enbridge Pipeline Release Ir. - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 14.5-14.75 Right Bank While Looking Downstream										
SCC4-19	Shoreline	Shoreline Assessment	X	•	•		Island floodplain oiling is moderate. OHV w/ small pockets of oil.		42.30242	-85.18083
EPA-C-0103	Not Provided	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30308	-85.18058
EPA-C-0104	Not Provided	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30270	-85.18153





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

Division C: Mile Marker 14.5-14.75
Right Bank While Looking Downstream

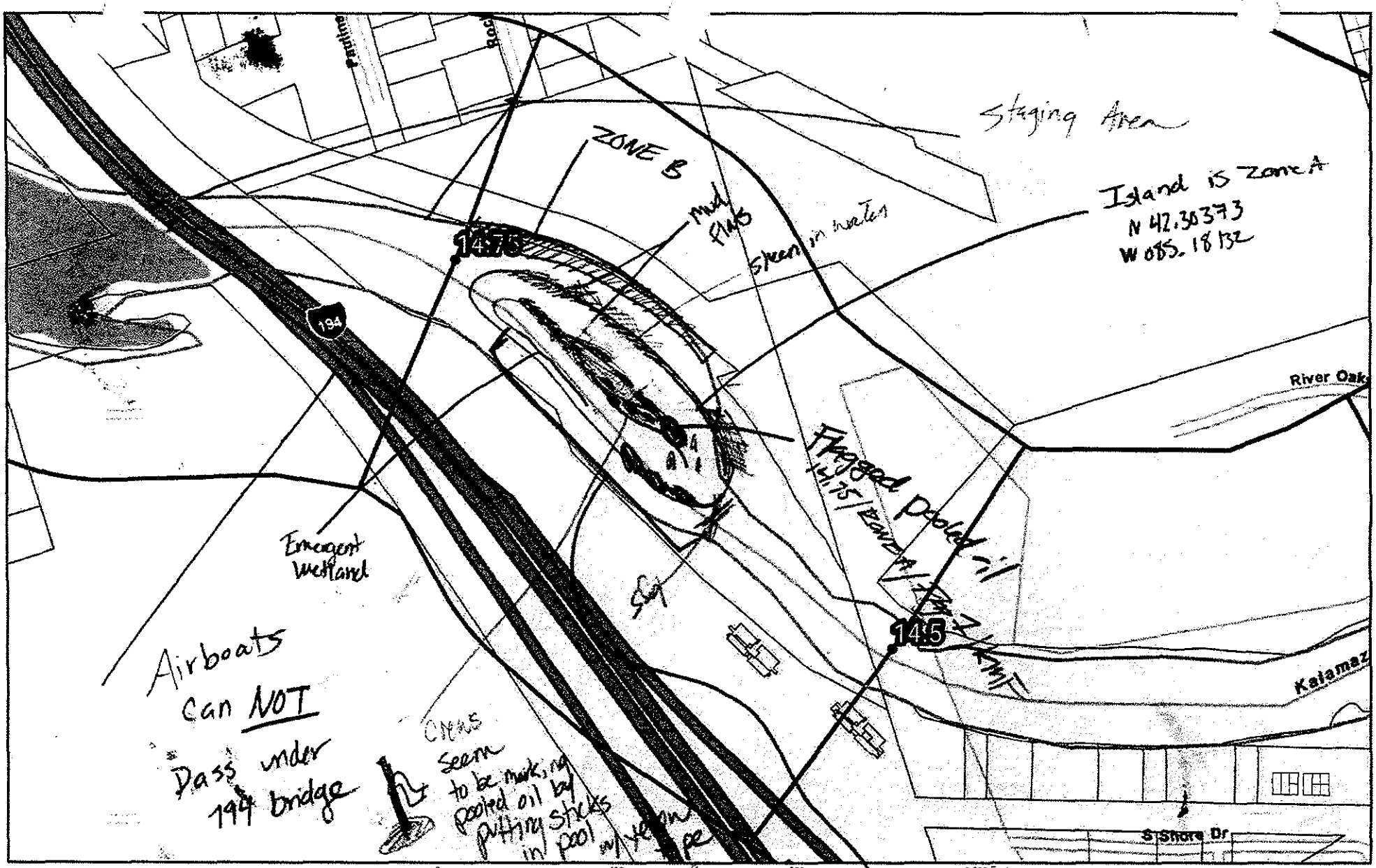
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuartermileMarkers
Parcels_102000Buffer
Shoreline
River_QuarterMiles
Divisions

Team 4

8/28/10

14.5 to 14.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

This side of island has been cut 2 trees

Image: 2009 NAIP

ENTR

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 09-13-10 **Time:** (AM) / PM 11:20

Operations Division: C **Segment ID: From** 14.5 **Start MP to End MP** 14.75 **Segment Length: 0.25 mile**

Bank: (LDB) (RDB) ☒ **Island** **Overbank:** (LOB) (ROB)

Weather: Sun/Cloud/Rain/Snow/ SUN

Field Inspection Team

Enbridge Inspector: Mark Bodson Mark Bodson

Division Supervisor(Contractor): Art Slyton Art Slyton

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

ALL WORK WAS COMPLETE IN THIS SECTION

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

ALL WORK IS COMPLETE IN THIS SECTION

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

ALL WORK IS COMPLETE IN THIS SECTION

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

ALL WORK IS COMPLETE IN THIS SECTION

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR) 14.75
Step 2

Date: 07140 **Time: AM / PM**

Operations Division: C **Segment ID: From** 14.5 **Start MP to End MP** 14.75 **Segment Length: 0.25 mile**

Bank: (LDB / RDB) ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Chad Vin

Division Supervisor(Contractor): LARRY Bice for Art Slayton

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 14.5-14.75 Left Bank While Looking Downstream											
SCC4-26	Shoreline	Shoreline Assessment	•	•	•	•	Logjam with derbis. Small amount of pooled oil. Flush to C5.		42.30143	-85.18028	(Y) / N
EPA-C-0361	Shoreline & Overbank	SCAT T2 08/28/2010	site was already flagged w/ yellow and black flags; photo 552 is looking downstream from milepost 14.5					sheen in river At all snags oiled debris and veg piling up behind and should be removed. Absorbant pad, shovel, minimize entry (to prevent unnecessary substrate contamination).	42.30256	-85.18168	(Y) / N
EPA-C-0362	Shoreline & Overbank	SCAT T2 08/28/2010	3 isolated spots 1 foot by I foot; photo 554 shows pooled oil; photo 556 is looking upstream from milepost 14.75					sheen in river At all snags oiled debris and veg piling up behind and should be removed	42.30377	-85.18241	(Y) / N
EPA-C-0101	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30355	-85.18172	(Y) / N
EPA-C-0102	Not Provided	SCAT T1 8/17/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30260	-85.18160	(Y) / N
EPA-C-0405	Shoreline & Overbank	SCAT T1 08/30/2010	pic 1012554 small pool of oil/tar near upstream of mp14.75. Technically this is in segment 14.75 and it has been flagged with yellow caution tape. Picture SAM0036 is mile point 14.75. Picture SAM0037 is mile point 15.0 continued 8/30/10 10:45 am. 8/30/10 AM team GV, MK, CC reported 5 oily female mallard ducks to the wildlife hotline. Wildlife rep said they were aware of the group and were going to try trapping them today. LDB wetalnds and upland surveyed; no oil					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30373	-85.18246	(Y) / N

Printed Team Members Name: Rachel Matthews, MIKE ZAMBETIS, HOWARD PHAM, USEPA
Date: 9-18-10
Comments:
* NOTE: SATURATED SOIL, OIL ACCUM AREA ALONG LDB ADDED TO SCAT RE-ASSESSMENT O&M FORM. (N42.30250, W85.18161), OCCURS IN SENSITIVE WETLANDS AREA. CARE SHOULD BE TAKEN NOT TO FURTHER DESTROY SUBJECT WETLAND. ABSORBENT BOOM & POM-POMS SHOULD BE PLACED ALONG 30' SHORELINE WIDTH TO PREVENT SHEEWING INTO RIVER.

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 14.5-14.75 Island											
EPA-C-0363	Shoreline & Overbank	SCAT T4 08/28/2010					Zone A consists of an island that has sensitive emergent wetlands. Generally, there are small tarry oil pools ranging from 1-3' in daim distributed primarily on the upstream portion of tip of land. These tarry pools have already been flagged w/yellow. One tagged pool has a sorbant rag in it. A high priority pool was tagged by the edge of the arrowheads on the KR side if the island.(Flag ID #14.75Z-A-F-2 KMF Evidence of several instances of tree limbs cut which were obviously >2" in diam. Saw one live snake; - Gardner? Black w/yellow stripe; approx. 1.75' long.	High Priority cleanup, numerous (>10 marked terry pools of thick tar and NAPL. Remove contaminated and impacted soils immeditaly	42.30373	-85.18132	(Y) / N

Printed Team Members Name: MIKE ZAMBETIS, Rachel Matthews, HOWARD PHAM, USEPA.
Date: 9/18/10
Comments: Removed ~~multiple~~ multiple logs >4", Piles of oily brush limbs should be removed before area is cleared

*NOTE: OILY POOLS HAVE BEEN CLEANED UP BUT SOME SHEEN AREAS & SATURATED SOIL AREAS REMAIN & NEED TO BE ATTENDED TO IN ONGOING O&M OPERATIONS

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 14.5-14.75 Right Bank While Looking Downstream											
SCC4-19	Shoreline	Shoreline Assessment	X	•	•		Island floodplain oiling is moderate. OHV w/ small pockets of oil.		42.30242	-85.18083	(Y) / N
EPA-C-0103	Not Provided	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30308	-85.18058	(Y) / N
EPA-C-0104	Not Provided	SCAT T1 8/18/2010	* ACTUALLY ON LEFT BANK DESCENDING — MOVE TO OTHER SHEET					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30270	-85.18153	(Y) / N

Printed Team Members Name: Dana Shouse (MDNRE)
Date: 9/15/10
Comments:
3 areas of tarry debris/sediment were marked w/ caution tape and had not been cleared — Crews called to clean

EPA-C-0103 Sheen on river near this point after we went through with boat. Just downstream the silt fence by road failed and there was washout of sand/gravel into river.

TEAM MEMBERS: MIKE ZAMBETTIS (ENBRIDGE), HOWARD PHAM, USEPA, Rachel Matthews (MDNRE)
DATE: 9/18/10
COMMENTS: AREA 14.75 CLEARED BUT POINT ON LAB ADDED TO SCAT RE-ASSESSMENT O&M FORM.

EPA-C-0104 appears to be on right bank, please refer to this page to write conclusions on investigation

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 14.5 **to MP** 14.75 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

15-Sept-10
Signature Doug DEREN (date) Enbridge

9-15-2010
Signature Eugene Dennis, EPA-OSC (date) EPA

4. **SCAT Reassessment**

9/10/10
Signature (date) Enbridge

9/18/10
Signature HOWARD PLATA (date) EPA

9-18-2010
Signature Rachel Matthews (date) MDNRE

5. **EPA**

9/22/10
Signature Jordan Garrard (date) EPA Division Supervisor

O+M needed at SCAT Points 0104, 0361, 0102 N 42° 18.1752 W 85° 10.8844 - Absorbent boom placement on shoreline and potential ~~sea~~ hot shot work needed.

Appendix E
Photographs

Field Photo Log – Segment 14.75



Photo 0844 – Facing northeast at right descending bank.



Photo 0845 – Facing south at left descending bank.

Field Photo Log – Segment 14.75



Photo 0848 – Facing southwest at left descending bank near SC4-26.



Photo 0852 – Facing north at island near SCC4-19 (zone A).

Field Photo Log – Segment 14.75



Photo 0854 – Facing north at right descending bank near EPA-C-103.



Photo 0855 – Facing north at island near EPA-C-0363 (zone A).

Field Photo Log – Segment 14.75



Photo 0858 – Facing north on island near EPA-C-0363 (zone A).



Photo 0861 – Facing south on island near EPA-C-0363 (zone A).

Field Photo Log – Segment 14.75



Photo 0862 – Facing north on island near EPA-C-0363 (zone A).



Photo 0864 – Facing north at island near EPA-C-0363 (zone A).

Field Photo Log – Segment 14.75



Photo 0865 – Facing east at right descending bank near EPA-C-0363.



Photo 0866 – Facing north at right descending bank.

Field Photo Log – Segment 14.75



Photo 0869 – Facing south at island near EPA-C-0363 (zone A).



Photo 0871 – Facing east at island near EPA-C-0363 (zone A).

Field Photo Log – Segment 14.75



Photo 0873 – Facing southwest at left descending bank near EPA-C-0361/EPA-C-0102/ EPA-C-0104.



Photo 0877 – Facing northwest at left descending bank.

Field Photo Log – Segment 14.75



Photo 0878 – Facing south at left descending bank near EPA-C-0362/EPA-C-0405.



Photo 0879 – Facing north at left descending bank near EPA-C-0362/EPA-C-0405.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 15.0 – MP 14.75 to 15.0

Enbridge Energy

September 23, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The left descending bank of Segment 15.0 had very light levels of oil staining downstream of the bridge located within the segment and heavy oil staining upstream of the bridge Tar coated vegetation, root holes with sheen, and small sporadic pools of oil were found on the left descending shoreline. Oiled vegetation, tar stained puddles, and oiled soil were found on the eastern tip of the island within the segment. There was very light staining on the right descending bank downstream of the bridge and light oil staining upstream of the bridge. Oiled vegetation, soil, debris, and pooled oil were found on the right descending bank. Pools of oil were found on the right descending overbank.

Actions

The shoreline cleanup activities within Segment 15.0 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Vegetation removal from the waterline leaving roots intact and woody plants greater than 2" in diameter;
- Manual oil removal;
- Manual removal of oiled debris;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Removal of pooled oil using portable vacuum or absorption techniques.

Outcome

The island in Segment 15.0 was recommended to be added to the operation and maintenance list to add absorbent pads in scraped zone displaying surface oil. The right descending bank was also recommended for the operation and maintenance list for additional boom in the right descending channel immediately adjacent to right bank.

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. Segment 15.0 was referred to the submerged oil team. The following conditions remain:

- Oiled herbaceous vegetation in the inlet on the left descending bank;
- Oiled debris on the left descending bank by the bridge;
- Oiled sediment on the right descending bank near channel;
- Oiled herbaceous vegetation on the right descending bank;

- Oily water and sheen in channel on right descending bank.
- .

Segment 15.0 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

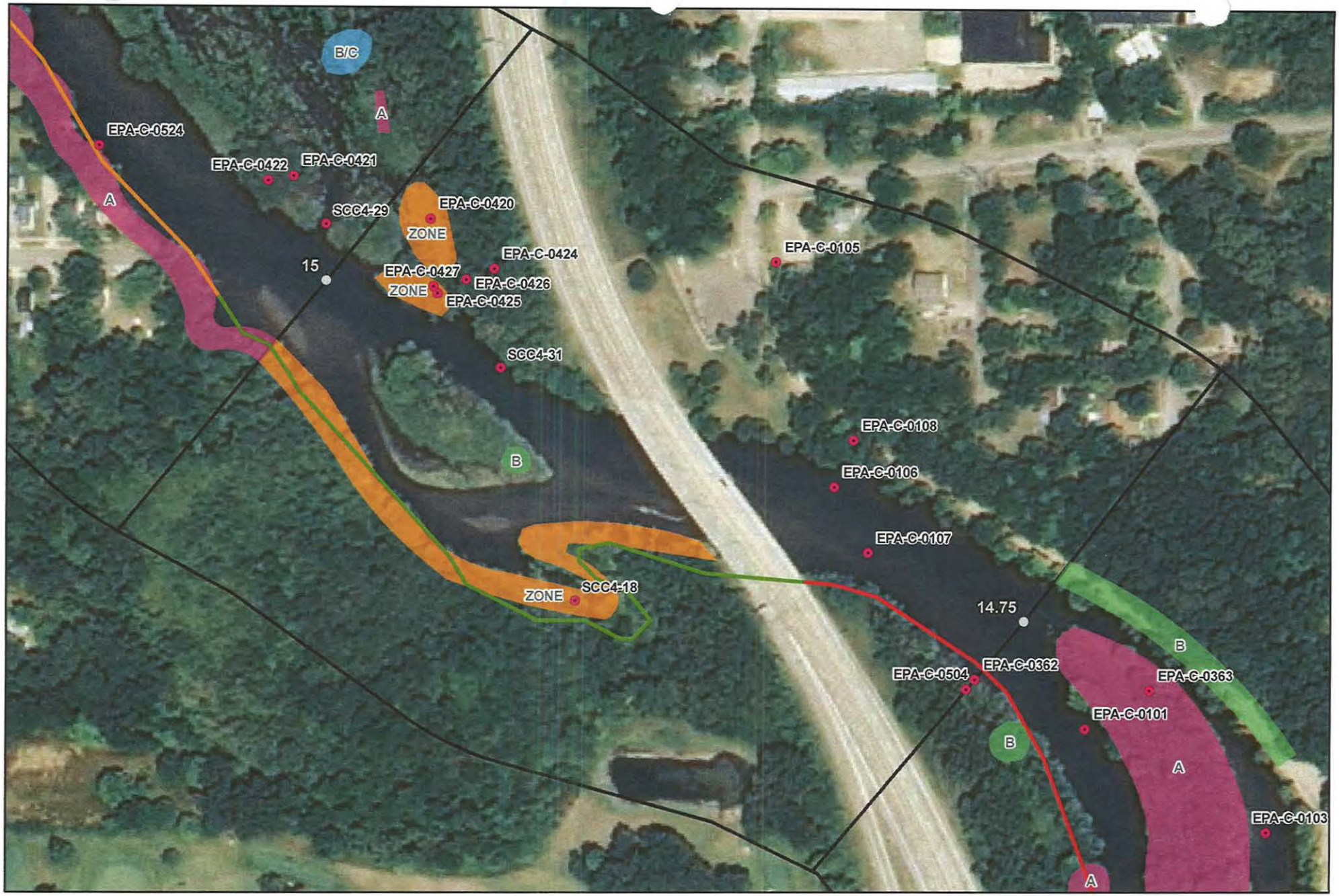
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

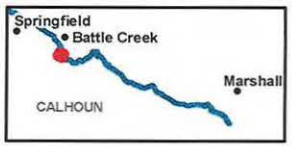
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Releas .nt - Kalamazoo River Oil Spill

OPERATIONS CL. .NUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 14.75-15 Left Bank While Looking Downstream										
EPA-C-0105	Not Provided	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30568	-85.18368
EPA-C-0106	Main Channel	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30465	-85.18330
EPA-C-0107	Not Provided	SCAT T1 8/17/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30435	-85.18308





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 14.75-15
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TEAM 1 8/30/10 S15 - [redacted]



QuartermileMarkers
Parcels_1020OftBuffer
Shoreline
River_QuarterMiles
Divisions

14.75 to 15.0

Enbridge Pipeline Release incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

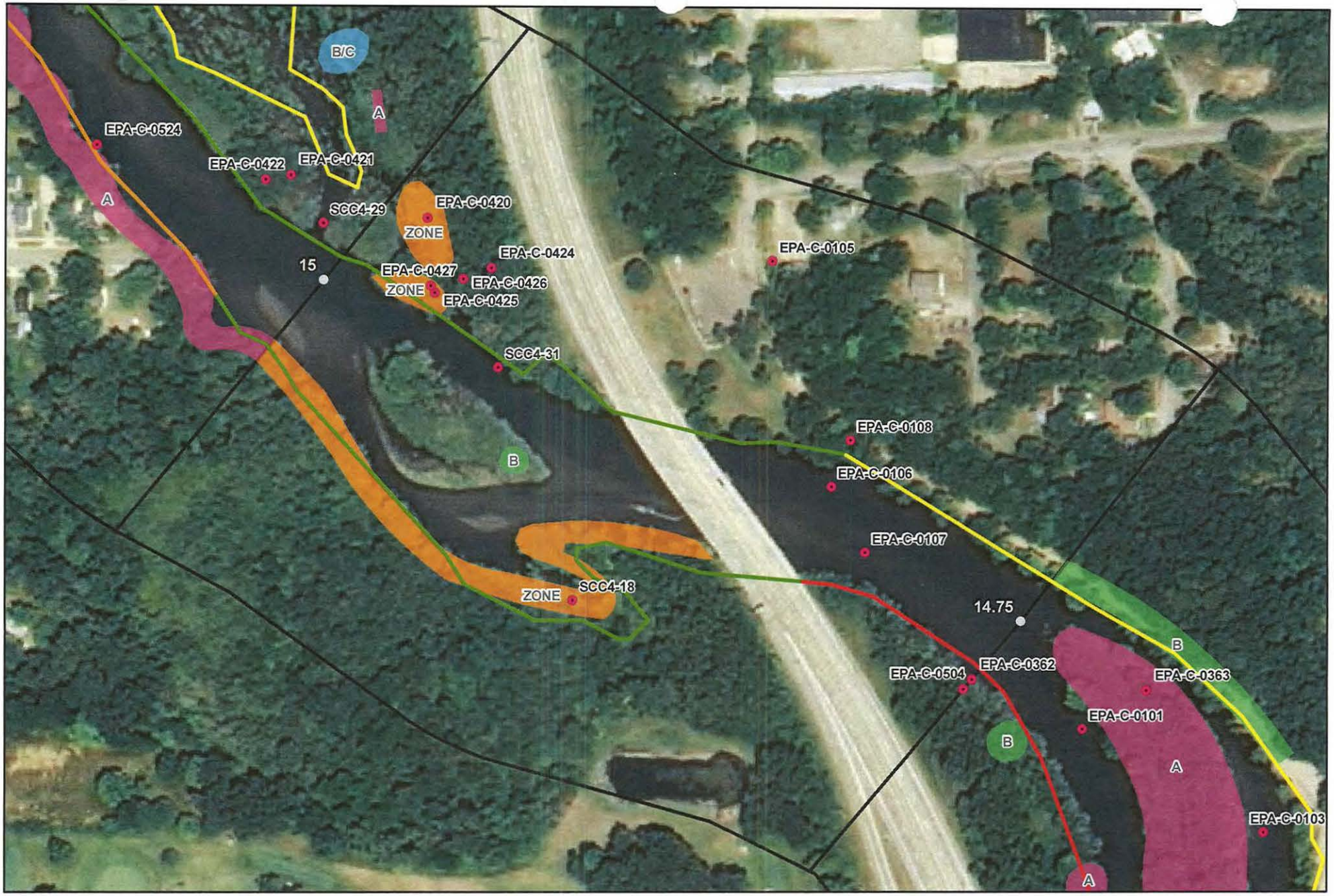
SHEET # 48

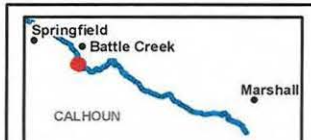
ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIC[illegible]TH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 14.75-15 Island										
EPA-C-0504	Shoreline	SCAT T1 08/28/10						Remove oil vegatation, leaving roots. Remove Tar stained puddle, vegatation and associated soil	42.30373	-85.18246





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B B/C C D E F G H NO OIL ZONE

Division C: Mile Marker 14.75-15 Island

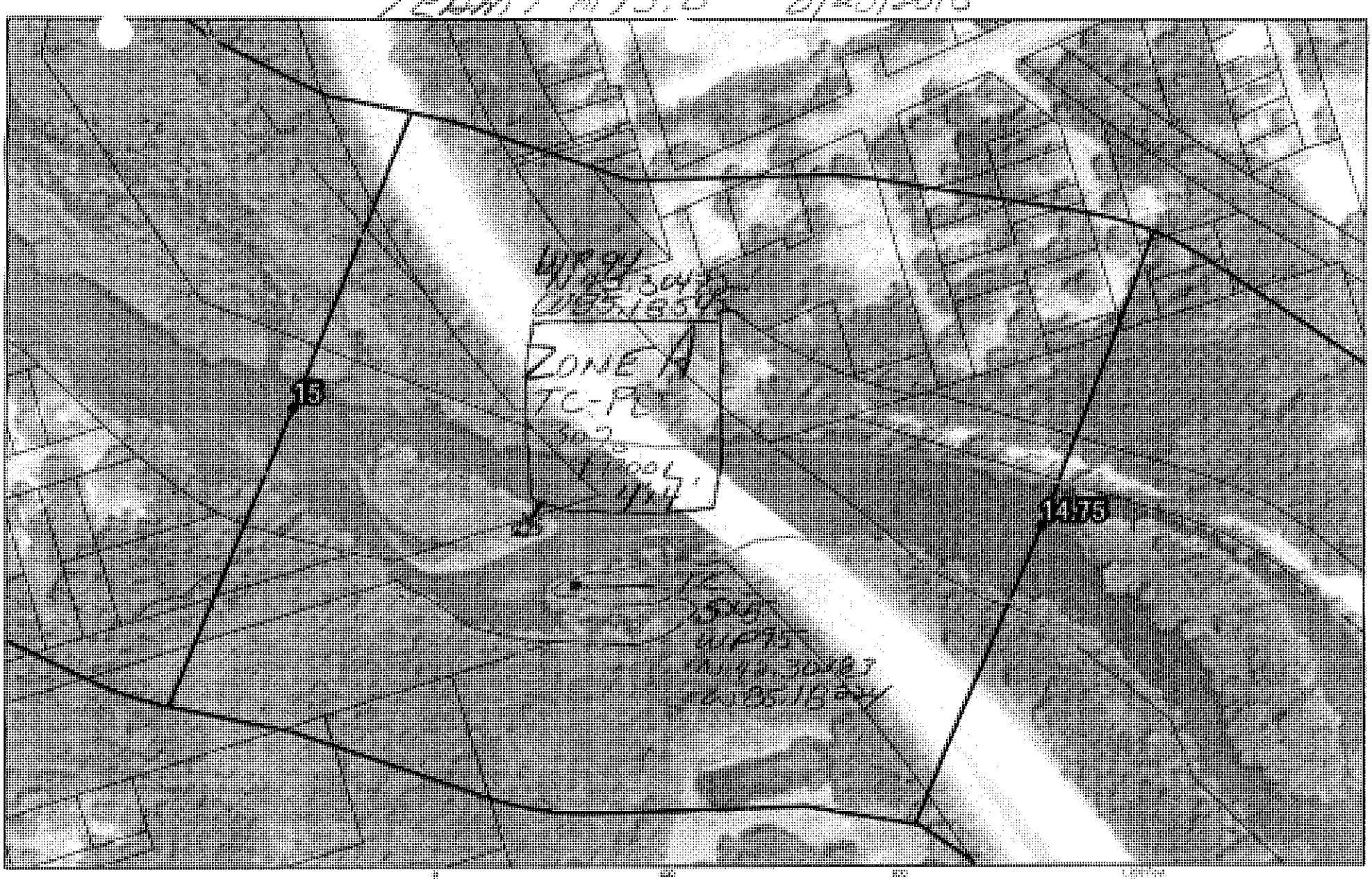
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

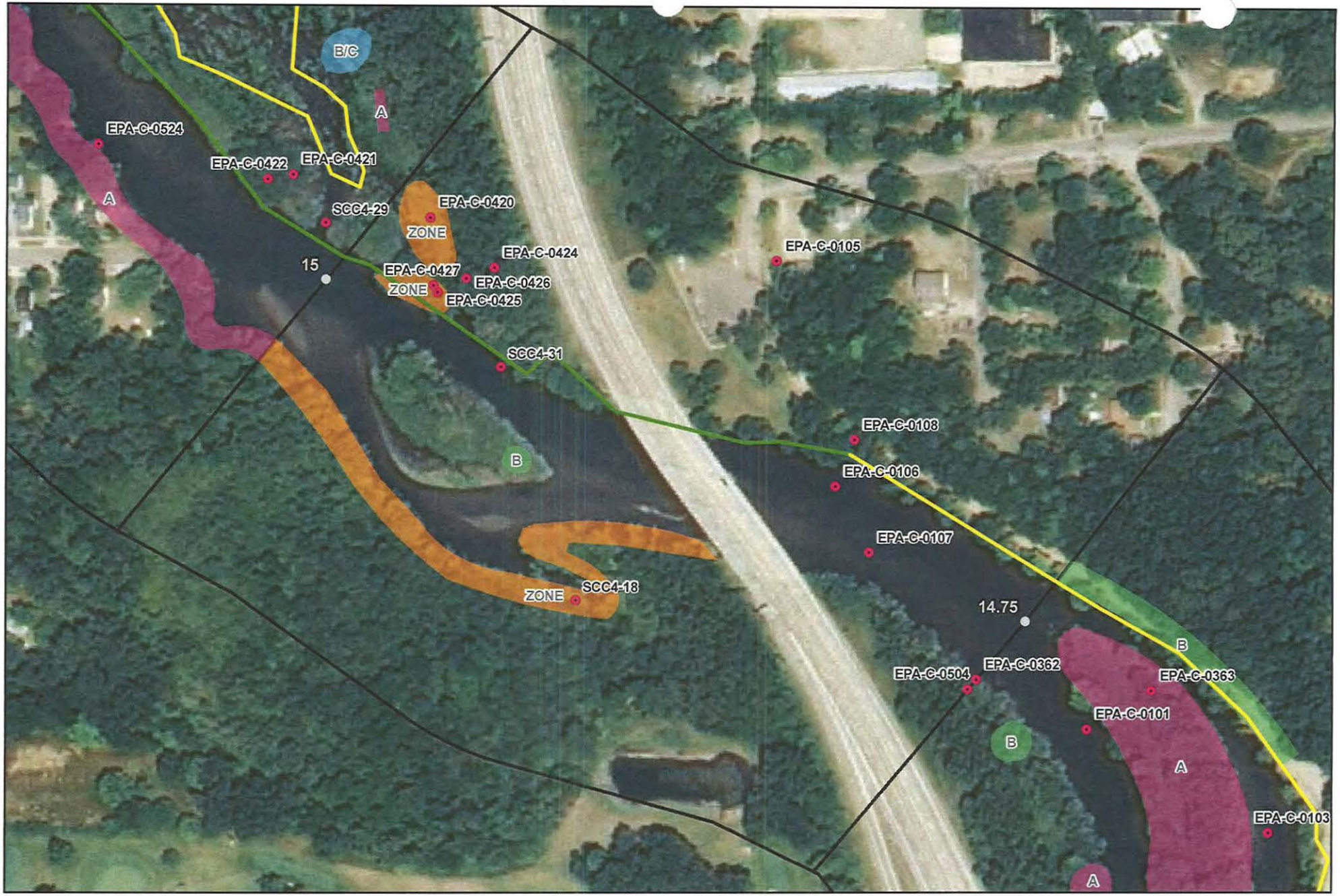


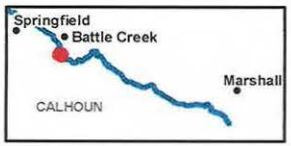
Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 14.75-15 Right Bank While Looking Downstream										
SCC4-18	Shoreline	Shoreline Assessment					Ongoing skimming and decon ops.		42.30412	-85.18490
SCC4-31	Shoreline	Shoreline Assessment	●		●	●	Flush to skim ops south of Burnham Bridge. High volume flush.		42.30518	-85.18538
EPA-C-0108	Not Provided	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30487	-85.18318
EPA-C-0420	Shoreline	SCAT T1 08/30/2010	oil also on water. reco pads & poms. Cooresponds with pictures SAM0038. Picture 0039 is of mile marker SAM0039.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30586	-85.18584
EPA-C-0424	Shoreline	SCAT T1 08/30/2010	silty clay loam, standing water. pooled oil along shorelines extending into 6in water that forms channel at wetland upland interface. Flag1. also observed logjam where oil collected in large woody debris. Segment 15.0 RDB data for rest of segment (upstream from bridge) was collected by Team 3 previously. Hot spots in this segment at island tip!					Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	42.30564	-85.18543
EPA-C-0425	Shoreline	SCAT T1 08/30/2010	flag2. six pools of tar, 5 pools on silty loam, 3 in.standing water associated w/ root zones. Segment 15.0 RDB data for rest of segment (upstream from bridge) was collected by Team 3 previously. Hot spots in this segment at island tip!					In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil.	42.30552	-85.18578
EPA-C-0426	Shoreline	SCAT T1 08/30/2010	flag3. 1 cm thick tar 15 ft from river edge. Segment 15.0 RDB data for rest of segment (upstream from bridge) was collected by Team 3 previously. Hot spots in this segment at island tip!					In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil.	42.30559	-85.18561
EPA-C-0427	Shoreline	SCAT T1 08/30/2010	flag4. Segment 15.0 RDB data for rest of segment (upstream from bridge) was collected by Team 3 previously. Hot spots in this segment at island tip!					In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil.	42.30555	-85.18581





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 14.75-15
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9-15-10 **Time:** (AM) / PM

Operations Division: C **Segment ID: From** 1475 **Start MP to End MP** 1500 **Segment Length: 0.25 mile**

Bank: (LDB) (RDB) ☐ **Island** **Overbank: LOB/ROB**

Weather: (Sun)/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Matt Bodson

Division Supervisor(Contractor): Art Slyton

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ **SCAT Requirements/Clean Up Complete or NA**

Reviewed all SCAT Pts. – cleared

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Reviewed all SCAT Pts and cleared with exception of points being ~~worked on~~ deemed ~~by~~ submerged oil locations (0424, 0425, 0426, 0427)

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 091510 **Time: AM / PM**

Operations Division: C **Segment ID: From** 14.75 **Start MP to End MP** 15.0 **Segment Length: 0.25 mile**

Bank: (LDB / RDB) ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Chad Vie

Division Supervisor(Contractor): Art Slayton

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

*NOTE – EPA 0424, 0425, 0426, & 0427 are areas of submerged oil. Remediation is ongoing with Contractor and approved by Jason Musante (USEPA) and John Gaudereau (Enbridge)

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

MM work complete

Ongoing remediation on above listed EPA points

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 14.75-15 Left Bank While Looking Downstream											
~~EPA-C-0105~~	Not Provided	SCAT T1 8/14/2010	Point does not exist					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30568	-85.18368	~~Y~~ / N
EPA-C-0106	Main Channel	SCAT T1 8/14/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30465	-85.18330	Y / N
EPA-C-0107	Not Provided	SCAT T1 8/17/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30435	-85.18308	Y / N

Printed Team Members Name: Mike Van Loon, Chris Lann, Ross DeRosario
Date: 9/21/10
Comments: [redacted] LDB

N 42.30471 = MID POINT OF CLEANUP AREA APPROX 30'X20'
W85.18616 APPROX 4 SMALL POOLED OIL SPOTS; BASE OF VEG TC.; 2 ROOT HOLES SHEEN & SOIL EDGES TC; 50% COVERED ZONE

Photo 136-141

RECOMMENDATION: BOOM OFF AREA
WAIT AT LEAST 3 DAYS TO RESCAT
CUT VEG ON SHORELINE IN TO 20' (ie Shrubs; RCG)
FLAGGED upstream and downstream as well as at root holes AND back edge of ZONE.

9/18/10

NOTE ON POOLS ASSOCIATED WITH BEAVER LODGE; Field cleanup crew indicate VACUUM truck to mobilize to site.

9/21/10 See revised O&M form. Requested additional pom pom to work crew in area.

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 14.75-15 Island											
EPA-C-0504	Shoreline	SCAT T1 08/28/10						Remove oil vegatation, leaving roots. Remove Tar stained puddle, vegatation and associated soil	42.30373	-85.18246	(Y) N

Printed Team Members Name: Mike Van Loan, Chris Conn, Ross DelRosario
Date: 9/21/10
Comments:

SEE OEM

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 14.75-15 Right Bank While Looking Downstream											
SCC4-18	Shoreline	Shoreline Assessment					Ongoing skimming and decon ops.		42.30412	-85.18490	(Y) / N
SCC4-31	Shoreline	Shoreline Assessment	•		•	•	Flush to skim ops south of Burnham Bridge. High volume flush.	/ NO LONGER PROTOCOL	42.30518	-85.18538	(Y) / N
EPA-C-0108	Not Provided	SCAT T1 8/18/2010						Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30487	-85.18318	(Y) / N
EPA-C-0420	Shoreline	SCAT T1 08/30/2010	oil also on water. reco pads & poms. Cooresponds with pictures SAM0038. Picture 0039 is of mile marker SAM0039.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30586	-85.18584	(Y) / N
*SEE O&M EPA-C-0424	Shoreline	SCAT T1 08/30/2010	silty clay loam, standing water. pooled oil along shorelines extending into 6in water that forms channel at wetland upland interface. Flag1. also observed logjam where oil collected in large woody debris. Segment 15.0 RDB data for rest of segment (upstream from bridge) was collected by Team 3 previously. Hot spots in this segment at island tip!					Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	42.30564	-85.18543	(Y) / N
EPA-C-0425	Shoreline	SCAT T1 08/30/2010	flag2. six pools of tar, 5 pools on silty loam, 3 in.standing water associated w/ root zones. Segment 15.0 RDB data for rest of segment (upstream from bridge) was collected by Team 3 previously. Hot spots in this segment at island tip!					In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil.	42.30552	-85.18578	(Y) / N
EPA-C-0426	Shoreline	SCAT T1 08/30/2010	flag3. 1 cm thick tar 15 ft from river edge. Segment 15.0 RDB data for rest of segment (upstream from bridge) was collected by Team 3 previously. Hot spots in this segment at island tip!					In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil.	42.30559	-85.18561	(Y) / N
EPA-C-0427	Shoreline	SCAT T1 08/30/2010	flag4. Segment 15.0 RDB data for rest of segment (upstream from bridge) was collected by Team 3 previously. Hot spots in this segment at island tip!					In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil.	42.30555	-85.18581	(Y) / N

Printed Team Members Name: Mike Van Loon, Chris Conn, Ross DeRosario
Date: 9/21/10
Comments: 9/18/10 O3M WRITTEN FOR ISLAND TIP; CLEANING HAS occurred; Some oil resurfacing following rain

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 14.75 **to MP** 15.00 **Segment Length: 0.25 mile**

1. **SCAT** [X]
2. **Clean up** [X]
3. **Inspection**

Matt Gordon 9-17-2010 Enbridge
Signature (date)

Eugene Dennis 9-17-2010 EPA
Signature Eugene Dennis, EPA OSC (date)

4. **SCAT Reassessment**

[signature] 9/21/10 Enbridge
Signature (date)

R. del Rosario 9/21/10 EPA
Signature Ross DEL ROSARIO (date) 9/21/10

[signature] 9/21/10 MDNRE
Signature Chris Conn (date)

5. **EPA**

[signature] 9/24/10 EPA Division Supervisor
Signature Jordan Gerrard (date)

OtM Spot on left bank downstream tip of island west of 194. Absorbent boom and snare deployed at location.
N 42° 18.2727 W 85° 11.154

Appendix E
Photographs

Field photo log – 15.0



Photo 0703 – Facing east at island



Photo 0704 – Facing southeast at left descending bank zone 1

Field Photo log – 15.0



Photo 0706 – Facing northwest at island



Photo 0710 – Facing northeast at right descending bank

Field Photo log – 15.0



Photo 0711 – Facing northwest at right descending bank



Photo 0713 – Facing northwest at right descending bank near SCC4-31

Field Photo log – 15.0



Photo 0714 – Facing north at right descending bank near EPA-C-0424



Photo 0716 – Facing north at right descending over bank near EPA-C-0427

Field Photo log – 15.0



Photo 0717 – Facing northwest at right descending over bank zone 2



Photo 0719 – Facing northwest at right descending overbank zone 3

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 15.25 – MP 15.0 to 15.25

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 15.25 had very light levels of oil staining on the upstream portion of the left descending bank and moderate levels of oil staining on the downstream portion of the left descending bank. Small patches of pooled oil and oil covered vegetation were also observed. There were no operational focus areas observed on the left descending overbank. One island does exist within the segment and oiled vegetation and debris were observed, as well as small patches of pooled oil. The right descending bank had very light levels of staining on the upstream portion, and light levels of staining on the downstream portion, as well as in the adjacent oxbow. Light sheen was observed on mud/marsh area along the bank. The overbank areas off the right descending bank contained puddle-like tar, oiled vegetation and debris requiring clean-up.

Actions

The shoreline clean-up activities within Segment 15.25 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Vegetation removal, leaving roots intact and woody plants greater than 2" in diameter;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Manual removal of oiled debris;
- Mobilization and capture of oil with boom or sorbent material before and during debris removal;
- Placement of two booms in channel for Operations and Maintenance purposes requested by Re-SCAT team;
- Pooled oil removal.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled rock/cobble and oiled woody vegetation remains along the shoreline of left descending bank;
- Oiled woody vegetation remains on the island within the segment;
- Sheen was observed on water near zone A.

Segment 15.25 has reached the operational endpoint for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill Clean-up Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials and sketch map)

    - Right Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank – Reassessment Conclusion Table
    - Right Descending Bank – Reassessment Conclusion Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release I, ent - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 15-15.25 Left Bank While Looking Downstream										
SCC4-27	Shoreline	Shoreline Assessment	●		●		Shallow floodplain. High volume flush to snare boom.		42.30708	-85.18870
SCC4-28	Shoreline	Shoreline Assessment	●	●		●	Logjam with small amt of pooled oil. High volume flush.		42.30728	-85.18890
SCC4-30	Shoreline	Shoreline Assessment	●		●		High volume flush - Burnham Bridge.		42.30820	-85.18922
EPA-C-0404	Shoreline	SCAT T1 08/30/2010	When sediments were disturbed, an oily film/sheen was kicked up. Resident Dwane met our team and asked where he could get help with oiled dog. MK gave hotline number and MK's office line & name. Resident said that on downstream side of channel no oil in upland, but when channel flooded oil came all the way to culver and almost deposited on upstream side of channel- lots of pools. no oil observed in channel or along banks. Residential area					Do not remove woody plants greater than 2"diameter as measured & Cut and Bag Low Hanging limbs extending over and into the water 2" above	42.30618	-85.18790





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 15-15.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

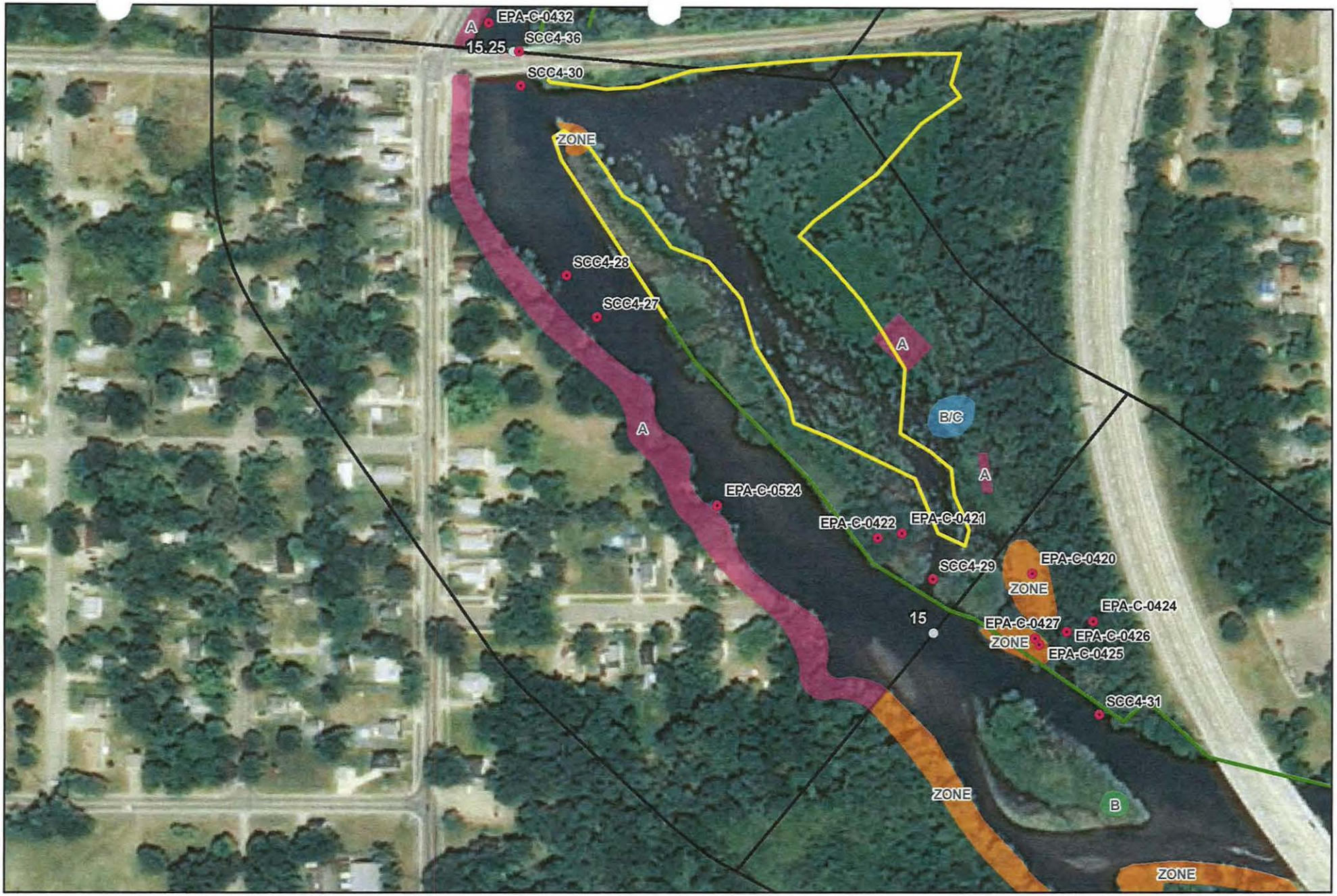
Coordinate System: NAD 1983 State Plane Michigan South Feet


15.25
15
Team 1
8/27/10
15.0 to 15.25
Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill
ENTRIX

Enbridge Pipeline Release Ir ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 15-15.25 Right Bank While Looking Downstream										
SCC4-29	Shoreline	Shoreline Assessment	?				Mud/marsh flats. Light oiling on water.		42.30583	-85.18648
SCC4-30	Shoreline	Shoreline Assessment	●		●		High volume flush - Burnham Bridge.		42.30820	-85.18922





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

Division C: Mile Marker 15-15.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Quarter mile Markers
Parcels_102001Buffer
Shoreline
River_QuarterMiles
Divisions

15.0 to 15.25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 46

ENTRIX
Down to Earth. Down to Business

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9-15-10 **Time:** (AM) / PM

Operations Division: C **Segment ID: From** 15 00 **Start MP to End MP** 15 25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☒ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Matt Robinson

Division Supervisor(Contractor): Art Slyter

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

REVIEWED ALL SCAT POINTS – CLEARED

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

REVIEWED ALL SCAT PTS – CLEARED

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

15.25

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 8/15/10 **Time: AM / PM**

Operations Division: _____ **Segment ID: From** 15.0 **Start MP to End MP** 15.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Chad Vis

Division Supervisor(Contractor): Art Slyter

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by team

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 15-15.25 Left Bank While Looking Downstream											
SCC4-27 ✓	Shoreline	Shoreline Assessment	•		•		Shallow floodplain. High volume flush to snare boom.		42.30708	-85.18870	(Y) / N
SCC4-28 ✓	Shoreline	Shoreline Assessment	•	•		•	Logjam with small amt of pooled oil. High volume flush.		42.30728	-85.18890	(Y) N
SCC4-30	Shoreline	Shoreline Assessment	•		•		High volume flush - Burnham Bridge.		42.30820	-85.18922	Y / (N)
57 EPA-C-0404	Shoreline	SCAT T1 08/30/2010	When sediments were disturbed, an oily film/sheen was kicked up. Resident Dwane met our team and asked where he could get help with oiled dog. MK gave hotline number and MK's office line & name. Resident said that on downstream side of channel no oil in upland, but when channel flooded oil came all the way to culver and almost deposited on upstream side of channel- lots of pools. no oil observed in channel or along banks. Residential area					Do not remove woody plants greater than 2"diameter as measured & Cut and Bag Low Hanging limbs extending over and into the water 2" above	42.30618	-85.18790	(Y) / N

Printed Team Members Name: Glenn Vondra Alta, Enbridge.
Christopher Clamp, IV, MDNR.
HOWARD PHAM, EPA.
Date: 9/17/10
Comments:

} NO PRESSURE WASHING
} NO ACTION NECESSARY

EPA-C-0404 changed to 0524

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 15-15.25 Island											
EPA-C-0422	SCAT T1 (8/30)						Puddle like tar vegetation and debris, remove this material 42.30603 -85.18684 (Y)/ N				
EPA-C-0421	SCAT T1 (8/30)						Oiled puddles and vegetation in Zone B, remove oiled puddles 42.30605 -85.18669 (Y)/ N				
		O&M Form for					Requested booms to be placed in channels; two placed				

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 15-15.25 Right Bank While Looking Downstream											
SCC4-29	Shoreline	Shoreline Assessment	?				Mud/marsh flats. Light oiling on water.		42.30583	-85.18648	(Y) / N
SCC4-30	Shoreline	Shoreline Assessment	•		•		High volume flush - Burnham Bridge.		42.30820	-85.18922	Y / (N)

Printed Team Members Name: Glenn Vondy Water
Christopher Claypit DNRE
Howard Pitam, EPA
Date: 9/17/10
Comments:

NOT PROTOCOL
NOT NECESSARY

SCRAPED PORTION OF RDB MK500 ON ORIGINAL SCAT — AREA Cleared.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From** 15.0 **Start MP to End MP** 15.25 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☐

3. **Inspection**

Signature _____ (date) _____ Enbridge

Signature _____ (date) _____ EPA

See other form. Signed After completion of Step 3.

4. **SCAT Reassessment**

Glenn Vande Walle 9/17/10 Enbridge
Signature Glenn Vande Walle (date)

Howard Pham 9/17/10 EPA
Signature Howard Pham (date)

9/17/10 MDNRE
Signature Christopher Clement (date)

5. **EPA**

9/22/10 EPA Division Supervisor
Signature Jordan Conrad (date)

O+M required on left bank on downstream side of Island.
Absorbent boom placement along shoreline. N 42° 18.2727, W 85° 11.1542

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 15.00 **to MP** 15.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Matt Balidson 16-SEPT-2010 Enbridge
Signature (date)

Eugene Dennis 9-16-2010 EPA
Signature (date)
Eugene Dennis, EPA OSC

cross-reference other signature page

4. **SCAT Reassessment**

_____ Enbridge
Signature (date)

_____ EPA
Signature (date)

_____ MDNRE
Signature (date)

5. **EPA**

_____ EPA Division Supervisor
Signature (date)

Appendix E
Photographs

Field Photo Log – Segment 15.25



Photo 0764 – Facing northwest at right descending overbank near EPA-C-0421/EPA-C-0422.



Photo 0765 – Facing north at right descending overbank near EPA-C-0421/EPA-C-0422.

Field Photo Log – Segment 15.25



Photo 0766 – Facing northeast at right descending overbank near EPA-C-0421/EPA-C-0422.



Photo 0767 – Facing north at right descending overbank near EPA-C-0421/EPA-C-0422.

Field Photo Log – Segment 15.25



Photo 0768 – Facing northwest at right descending overbank near EPA-C-0421/EPA-C-0422.



Photo 0769 – Facing north at right descending bank near SCC4-29.

Field Photo Log – Segment 15.25



Photo 0770 – Facing north at right descending bank near SCC4-29.



Photo 0771 – Facing northeast at right descending overbank within zone A.

Field Photo Log – Segment 15.25



Photo 0772 – Facing northwest at right descending overbank within zone A.



Photo 0773 – Facing west at right descending overbank within zone B/C.

Field Photo Log – Segment 15.25



Photo 0774 – Facing west at right descending overbank within zone B/C.



Photo 0775 – Facing west at right descending overbank within zone B/C.

Field Photo Log – Segment 15.25



Photo 0776 – Facing west at right descending overbank within zone A.



Photo 0777 – Facing northwest at right descending overbank.

Field Photo Log – Segment 15.25



Photo 0778 – Facing west at right descending overbank.



Photo 0779 – Facing north at right descending overbank.

Field Photo Log – Segment 15.25



Photo 0780 – Facing north at right descending overbank near SCC4-30.



Photo 0788 – Facing southeast at left descending bank near EPA-C-0524.

Field Photo Log – Segment 15.25



Photo 0791 – Facing west at left descending bank near EPA-C-0524.



Photo 0792 – Facing southeast at island.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 15.5 – MP 15.25 to 15.5

Enbridge Energy

September 21, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 15.5 had very light levels of oil staining present in the uppermost portion of the left descending bank and moderate to very light levels of oil staining further downstream within the segment. Stained vegetation and sediment was observed throughout the left descending bank, along with oil stained cobble and large boulders on the upstream shoreline. The overbank areas of the left descending bank contained no operational focus areas. Special consideration was mentioned for a wetland area with stained vegetation located on the left descending bank, as well as rip rap and bridge abutments that were heavily coated and stained. The island contained cobble and large boulders with sporadic oil staining. The right descending bank had very light levels of oil staining, as well as pooled oil, tarred vegetation and oiled debris. Special consideration was mentioned for a pond area at the tip of the peninsula on the right descending bank.

Actions

The shoreline clean-up activities within Segment 15.5 consisted of the following:

- Low pressure / high volume flush with downstream snare and boom capture;
- Vegetation removal, leaving roots intact and woody plants greater than 2" in diameter;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- High pressure, cold water wash on oil covers (oil > 0.1cm to < 1 cm thick) and absorption methods on larger rocks and boulders with downstream snare and boom capture;
- Mobilize and capture oil with boom or sorbent material;
- Deployment of oil skimmer to remove sheen from water surface.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oil stained manmade structures along the left descending bank in SCAT zone A;
- Oiled rock/cobble along the left descending bank in SCAT zone A and B;
- Oiled soil along the left descending bank in SCAT zone A;
- Oil sheen present in lilies located in silt funnel area on the right descending bank in SCAT zone A.

Segment 15.5 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

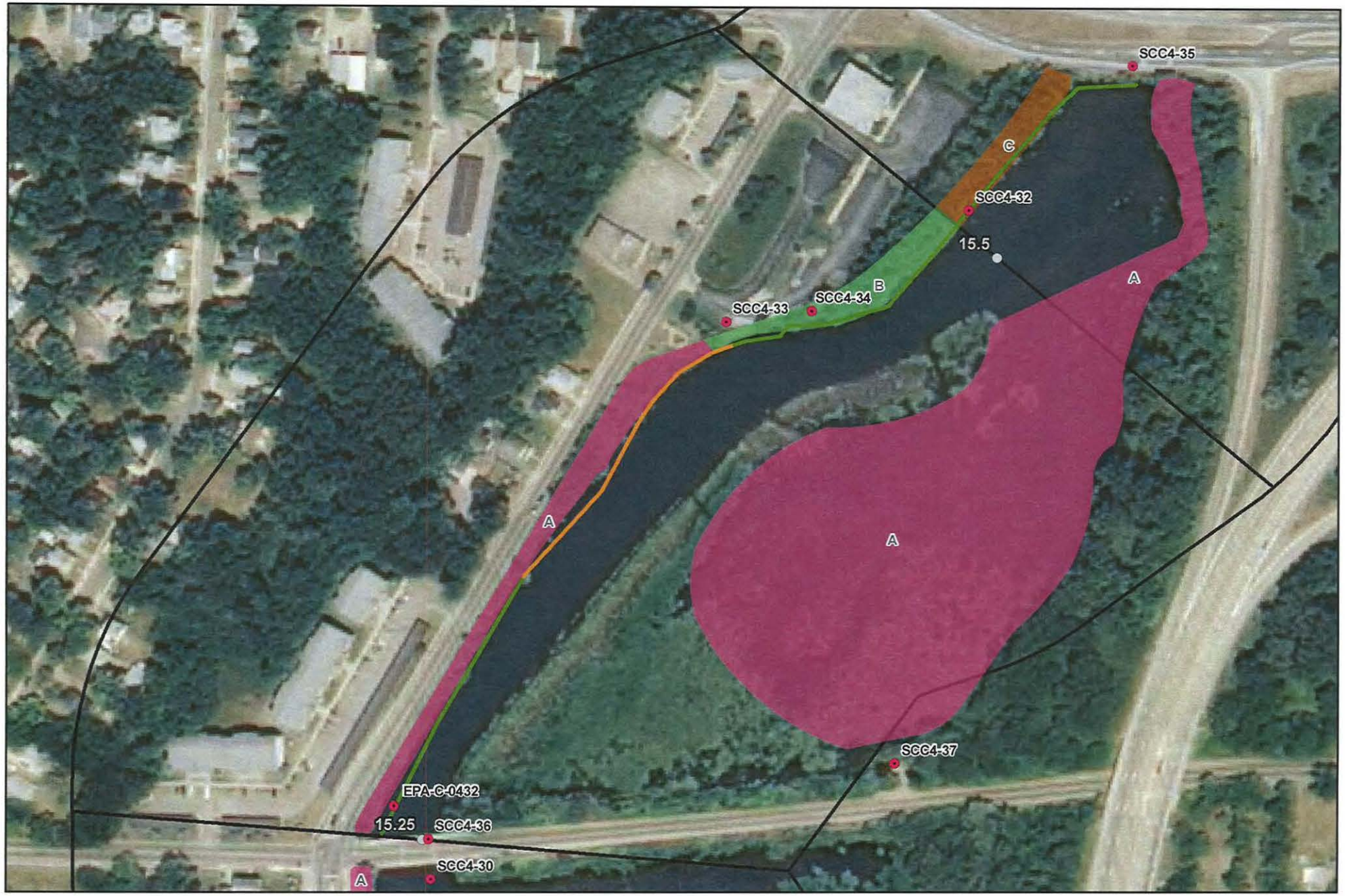
- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 15.25-15.5 Left Bank While Looking Downstream										
SCC4-33	Shoreline	Shoreline Assessment	●		●	●	Upstream of Boom C6. Oiled shoreline. Cut & remove vegetation. Already skimming. Skim sheen to oil skimmer.		42.31055	-85.18758
SCC4-36	Shoreline	Shoreline Assessment	●		●	●	Downstream of bridge left bank - oiled bank & low hanging brush. Cut vegetation. Flush riprap with high volume wash & collect at skimmer downstream.		42.30837	-85.18923





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 15.25-15.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

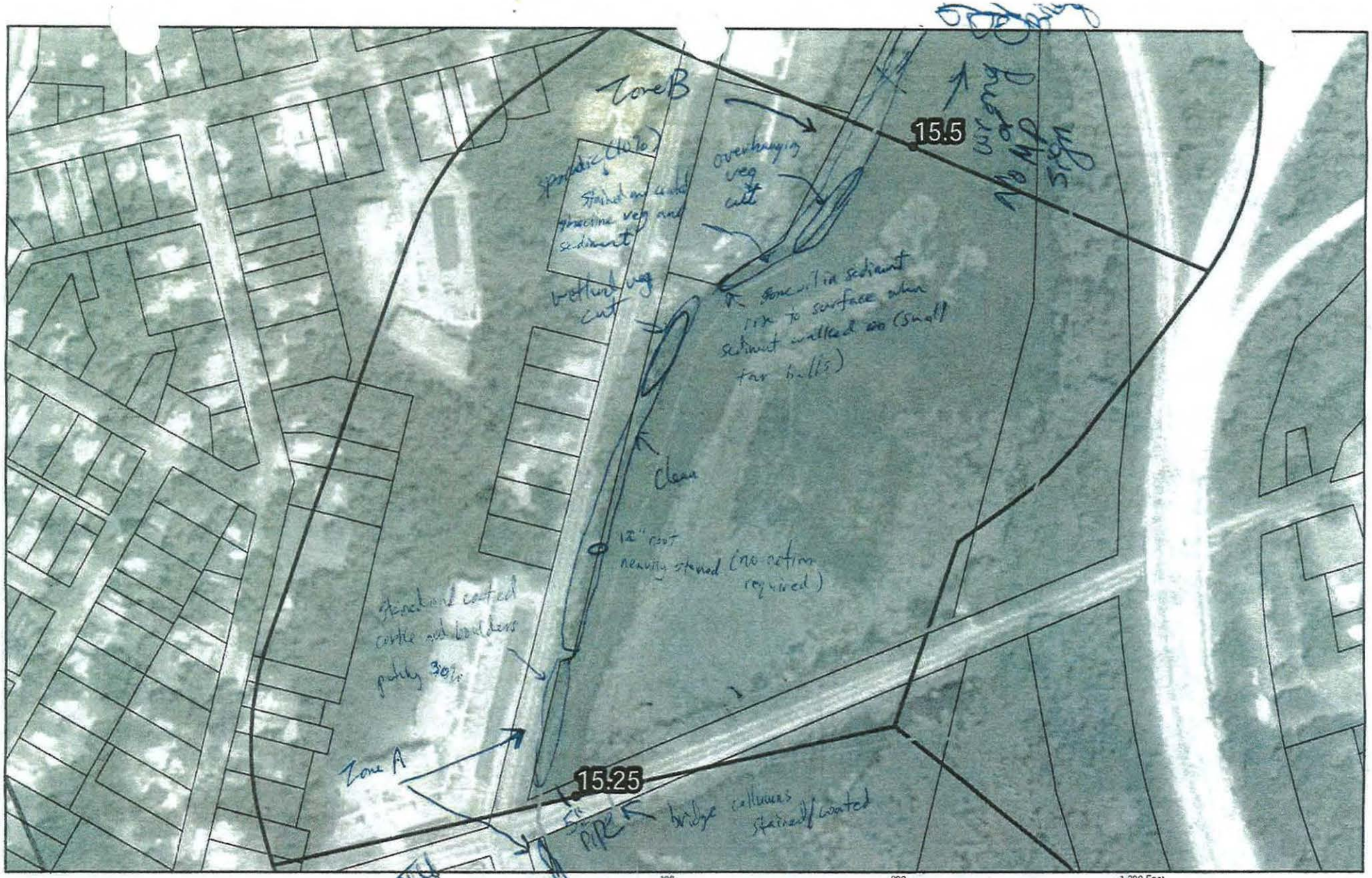
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuartermileMarkers
Parcels_1020ftBuffer
Shoreline
River_QuarterMiles
Divisions

TEAM #4

15.25 to 15.5

8/30/10

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image 2005 NAIP

SHEET # 48

ENTRIX
Down to Earth, Down to Business

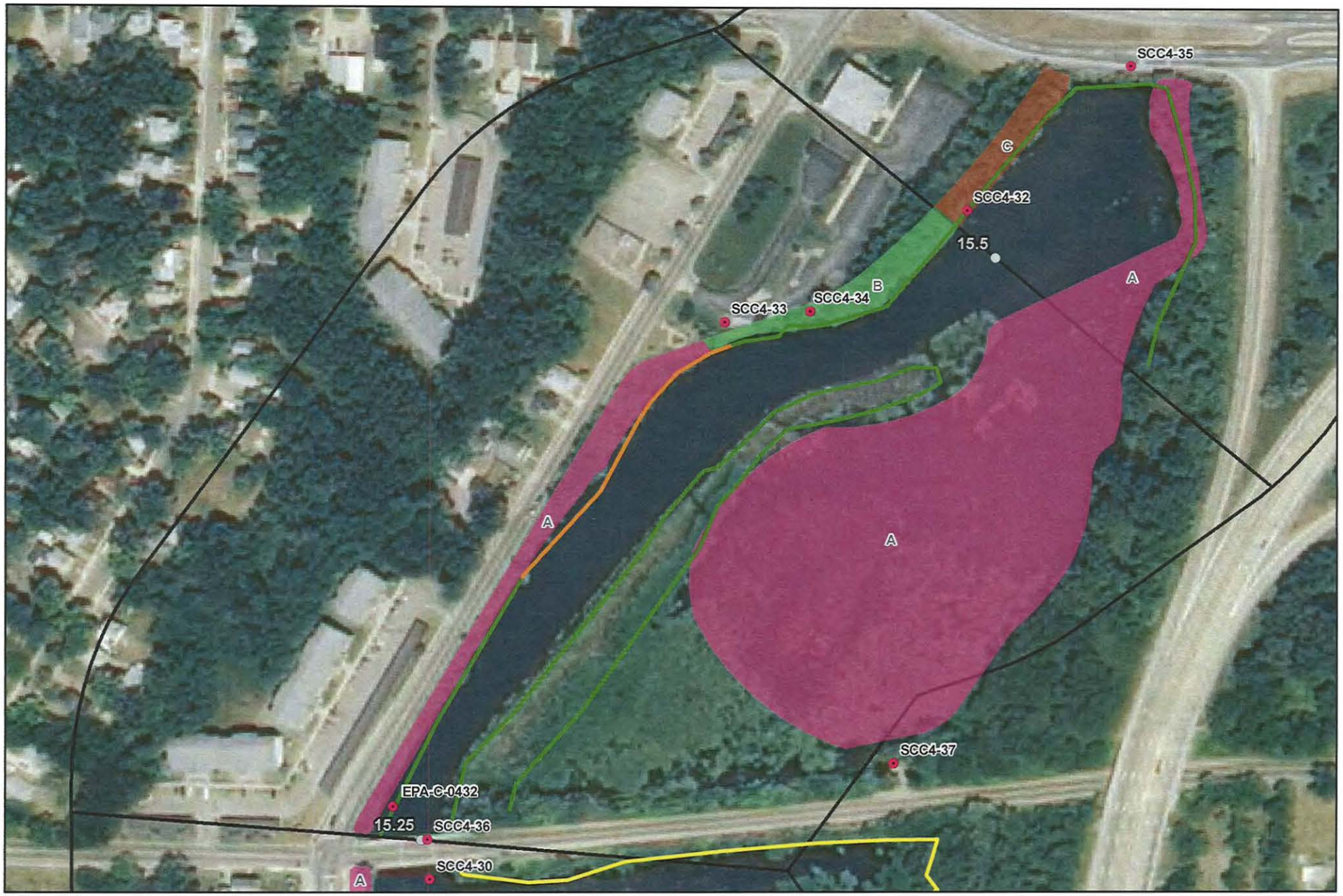
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Enbridge Pipeline Release In... - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 15.25-15.5 Island										
EPA-C-0432	Shoreline	SCAT T4 08/30/2010	Overall, sporatic staining on cobble/boulders. Section between Zone A and Zone B looked clean. Zone B access limited by fence along upper bank. Bridge abutment on LDB heavily coated/stained. Water level currently low. Boulders/cobbles coated and stained, Burnham Rd bridge collums stained.Intermittent banding at water level and approx 3' up.					High Pressure cold Water wash	42.30850	-85.18943





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B B/C C D E F G H NO OIL ZONE

Division C: Mile Marker 15.25-15.5 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

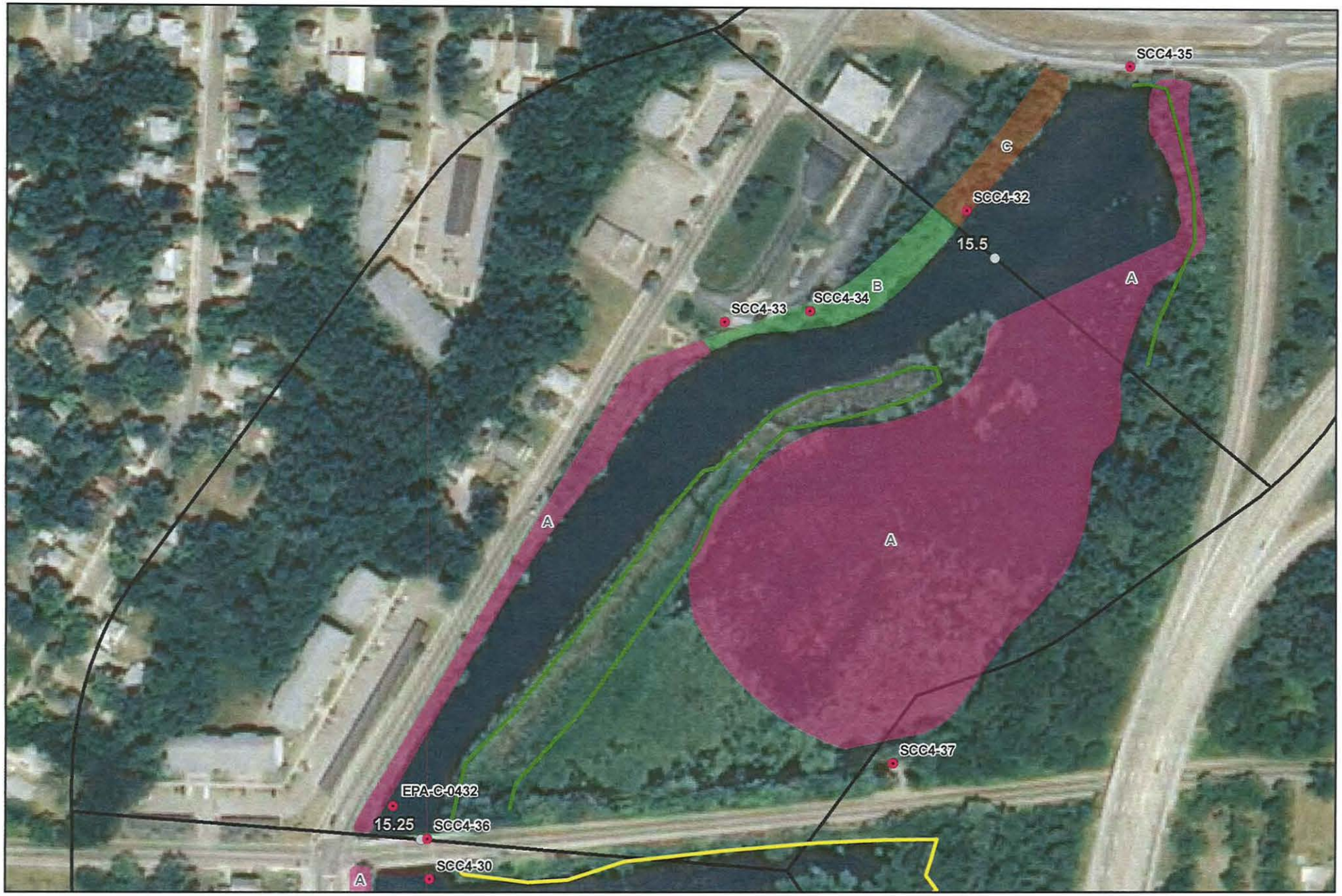
ENTRIX
www.entrix.com

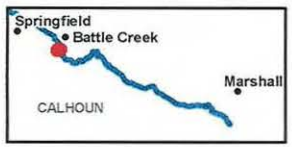
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Inc. - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 15.25-15.5 Right Bank While Looking Downstream										
SCC4-34	Shoreline	Shoreline Assessment			?	?	Wetland area with lilly pads. Need further assessment.		42.31060	-85.18710
EPA-C-0421	Shoreline	SCAT T1 08/30/2010	PictureSAM0041 corresponds with oiled puddle and veg in zone B					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30605	-85.18669
EPA-C-0422	Shoreline	SCAT T1 08/30/2010	puddle-like patches of tared veg & debris (~10)					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30603	-85.18685





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 15.25-15.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



0 400 800 1,200 Feet

0 120 240 360 Meters

QuarterMileMarkers
Parcels_10700Buffer
Shoreline
River_QuarterMiles
Divisions

Team 3
08/30/2010

15.25 to 15.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET 7 of 45

ENTRIX
Down to Earth, Down to Business

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9-15-10 **Time:** AM / PM

Operations Division: C **Segment ID: From** 1525 **Start MP to End MP** 1530 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☒ **Island** **Overbank:** LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Matt Bordson MATT BORDSON

Division Supervisor(Contractor): Art Slayton

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

REVIEWED ALL SCAT POINTS - CLEARED

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

REVIEWED ALL SCAT POINTS - CLEARED

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 09/15/10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 15.25 **Start MP to End MP** 15.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

Enbridge Inspector: [signature] Chad Vice

Division Supervisor(Contractor): [signature] Art Slyton

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 15.25-15.5 Left Bank While Looking Downstream											
SCC4-33	Shoreline	Shoreline Assessment	•		•	•	Upstream of Boom C6. Oiled shoreline. Cut & remove vegetation. Already skimming. Skim sheen to oil skimmer.		42.31055	-85.18758	(Y) / N
SCC4-36	Shoreline	Shoreline Assessment	•		•	•	Downstream of bridge left bank - oiled bank & low hanging brush. Cut vegetation. Flush riprap with high volume wash & collect at skimmer downstream.		42.30837	-85.18923	(Y) / N

Printed Team Members Name: Christopher Clang, II DNRE
Date: 9/1/2010 Glenn Varner Weston NRC
Comments: Howard Phan, EPA.

Flushing not done as per protocol.

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 15.25-15.5 Island											
EPA-C-0432	Shoreline	SCAT T4 08/30/2010	Overall, sporatic staining on cobble/boulders. Section between Zone A and Zone B looked clean. Zone B access limited by fence along upper bank. Bridge abutment on LDB heavily coated/stained. Water level currently low. Boulders/cobbles coated and stained, Burnham Rd bridge collums stained.Intermittent banding at water level and approx 3' up.					High Pressure cold Water wash	42.30850	-85.18943	Y / N

Printed Team Members Name: Christopher Clamp II, DNRE
Date: 9/17/10
Comments: [illegible] NRG
Howard Pham, EPA

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 15.25-15.5 Right Bank While Looking Downstream											
SCC4-34	Shoreline	Shoreline Assessment			?	?	Wetland area with lilly pads. Need further assessment.		42.31060	-85.18710	Y / N
EPA-C-0421	Shoreline	SCAT T1 08/30/2010	PictureSAM0041 corresponds with oiled puddle and veg in zone B					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30605	-85.18669	Y / N
EPA-C-0422	Shoreline	SCAT T1 08/30/2010	puddle-like patches of tared veg & debris (~10)					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.30603	-85.18685	Y / N

Printed Team Members Name: Christopher Clamp, ONRE
Glenwood Watt, NRE
Howard Pham, EPA
Date: 9/17/10
Comments:

9/17/10
MANDY who SCRATCHED RDB INDICATED THAT THERE WAS NOT A ZONE B

NO ZONE ~~B~~ ON RDB
* COULD NOT FIND SPECIFIC AREA; ASSUME IN POND AREA AT TIP OF PENINSULA
BOOMED; SKIRTED - INFORMED THAT ACTION DISCONTINUED BECAUSE NO OIL PRESENT.
SHORELINE CLEANED UP
O&M DEVELOPED FOR BOOM ON LDB

EPA-C-0421 and 0422 are shown in the data for segment 15.25 and will be assessed as such, do not assess in this reassessment package

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 15.25 **to MP** 15.50 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Matt Bordson 16-Sept-2010 Enbridge
Signature (date)

Eugene Dennis 9-16-2010 EPA
Signature (date)
Eugene Dennis, EPA OSC

4. **SCAT Reassessment**

Glenn Vand Water 9/18/10 Enbridge
Signature Glenn Vand Water (date)

Eduardo Rovira 9/18/10 EPA
Signature Eduardo Rovira (date)

James Saller 9-18-10 MDNRE
Signature James Saller (date)

5. **EPA**

9/22/10 EPA Division Supervisor
Signature (date)
Jordan Garrard

Mill Pond referred to Submerged Oil group.

Appendix E
Photographs

Field Photo Log – Segment 15.5



Photo 0881 – Facing west at left descending bank near EPA-C-0432/SCC4-36.

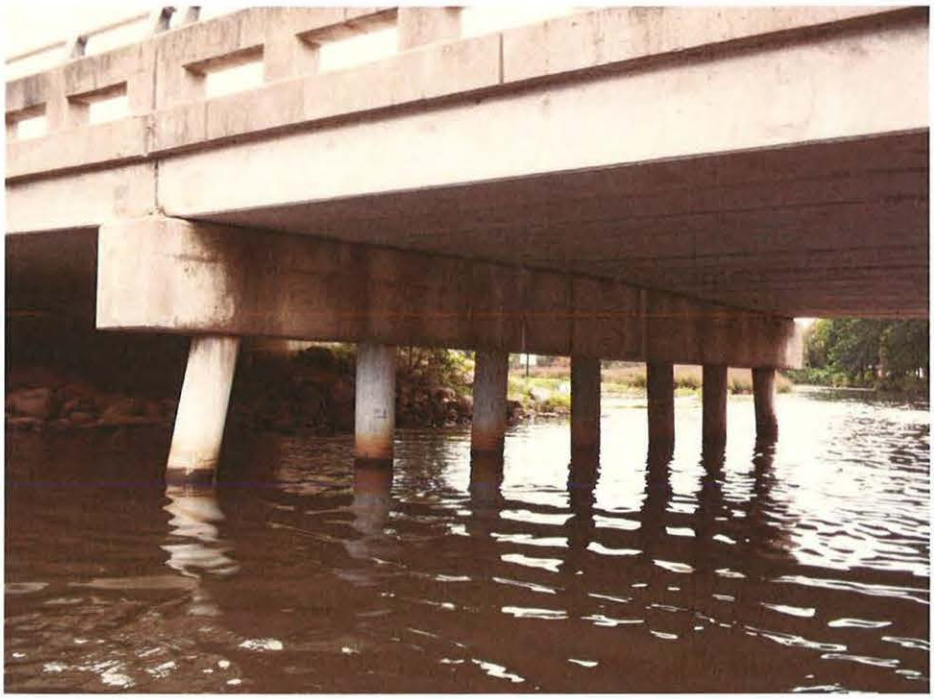


Photo 0882 – Facing southeast at right descending bank.

Field Photo Log – Segment 15.5

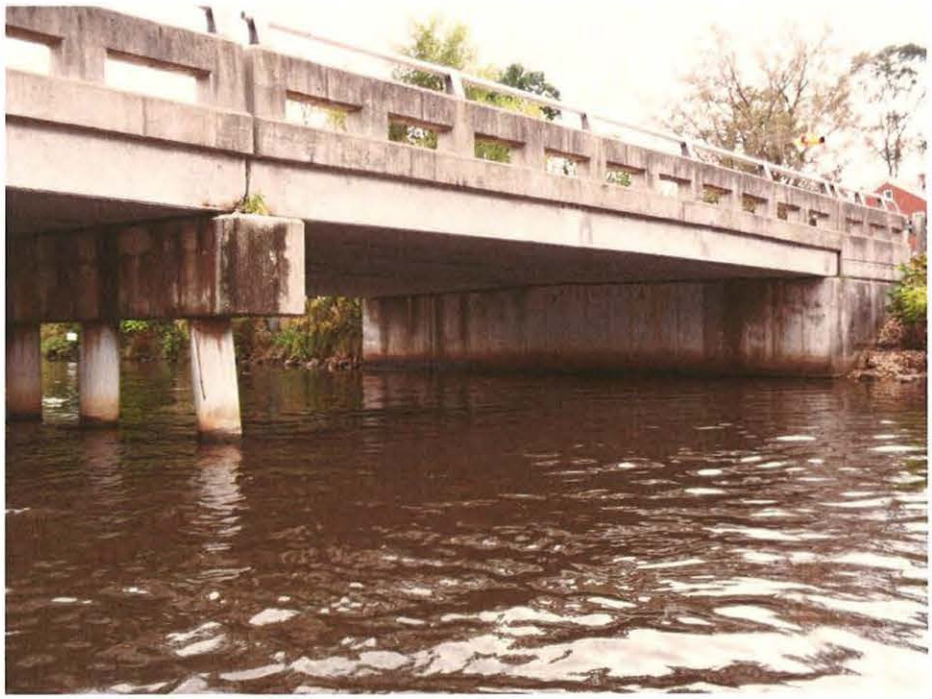


Photo 0883 – Facing southwest at left descending bank.



Photo 0884 – Facing northeast at right descending bank.

Field Photo Log – Segment 15.5



Photo 0885 – Facing northwest at left descending bank near zone A.



Photo 0886 – Facing northeast at right descending bank.

Field Photo Log – Segment 15.5



Photo 0887 – Facing northwest at left descending bank near zone A.



Photo 0888 – Facing northeast at right descending bank.

Field Photo Log – Segment 15.5



Photo 0889 – Facing northwest at left descending bank near zone A.



Photo 0890 – Facing northwest at left descending bank near SCC4-33/SCC4-34.

Field Photo Log – Segment 15.5



Photo 0891 – Facing north at left descending bank near SCC4-33/SCC4-34.



Photo 0894 – Facing west at left descending bank near SCC4-32.

Field Photo Log – Segment 15.5



Photo 0898 – Facing east at marsh near zone A.



Photo 900 – Facing southeast at marsh near zone A.

Field Photo Log – Segment 15.5



Photo 904 – Facing northeast at marsh near zone A.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 15.75 – MP 15.5 to 15.75

Enbridge Energy

September 21, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

During the initial SCAT process, recommendations were made within this segment. Prior to any work being completed during the operations phase, the City of Battle Creek communicated concerns about the release of previously existing contaminants during flushing or power washing of rip rap within this segment. A procedure for remediation on these hard surfaces was created and follows this report. Re-SCAT was completed to assess issues within the segment not pertaining to hard surfaces and rip rap areas.

During the initial SCAT assessment conducted on August 20, 2010, the shoreline of segment MP 15.75 had very light levels of oil staining on the left descending bank upstream of the bridge located within the segment, and light staining downstream of the bridge. The left descending shoreline also contained patches of oiled vegetation and debris. The island observed in this segment contained sporadic oil staining on cobbles and boulders, and stained and coated vegetation. The right descending shoreline had very light oil staining upstream of the bridge located within the segment. The right descending shoreline also contained patches of oiled vegetation and riprap. The bridge abutments located within the segment were heavily oil coated/stained.

Actions

The shoreline clean-up activities within Segment 15.75 consisted of the following:

- Vegetation removal from the waterline leaving roots intact and woody plants greater than 2 inches in diameter;
- Manual removal of oiled debris;

Outcome

Oil staining was not removed in some areas to help ensure preservation of sensitive ecosystems and habitat as required by Table 2 and the city of Battle Creek. The following conditions remain:

- Oiled herbaceous vegetation in zone B on left descending bank;
- Oiled rocks/cobbles along left descending bank, below bridge;
- Oiled rocks/cobble and herbaceous vegetation in zone B on right descending bank;
- Oiled soil on northwest side of Lower Mill Pond along right descending bank.

Segment 15.75 has reached the operational endpoints for the oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

ENBRIDGE OIL SPILL CLEANUP PROCEDURE FOR THE RIPRAP SECTION OF THE FLOOD CONTROL PROJECT WITHIN THE KALAMAZOO RIVER

Description. This work includes removing and replacing riprap on the levees of the City of Battle Creek Flood Control Channel.

Materials. Furnish plain riprap in accordance with Section 916 and furnish geotextile liner, where necessary, in accordance with Section 910 of the 2003 Michigan Department of Transportation Standard Specifications for Construction.

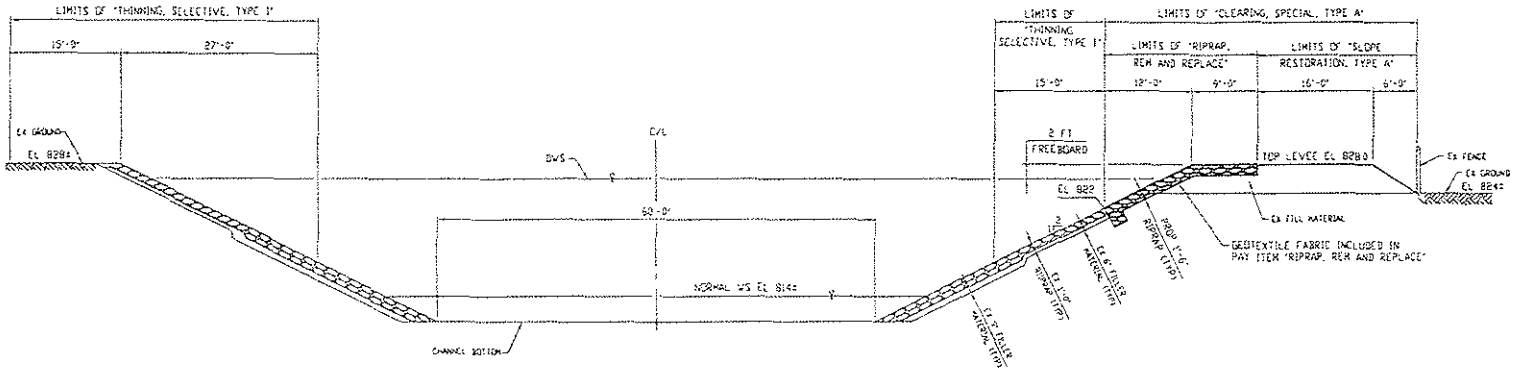
Cleanup. All work shall conform to the Section 813 of the 2003 Michigan Department of Transportation Standard Specifications for Construction, except as modified herein.

All oiled rocks must be removed from the riprap section. Check geotextile fabric for any oil. If oil is present, replace the fabric in accordance to the specifications above.

If areas have only remnants of geotextile fabric, then the levees shall be cleared of vegetation, including root balls, to the limits as shown on the plans. Prior to placing geotextile liner below the riprap, embankment shall be placed so that the reconstructed levee will match the original design elevations.

**Note: The soil beneath the riprap in the area downstream of the Mill Pond Dam is contaminated. Use caution while working. In addition, the soil will need to be removed, stockpiled, tested, and disposed of properly based on test results.*

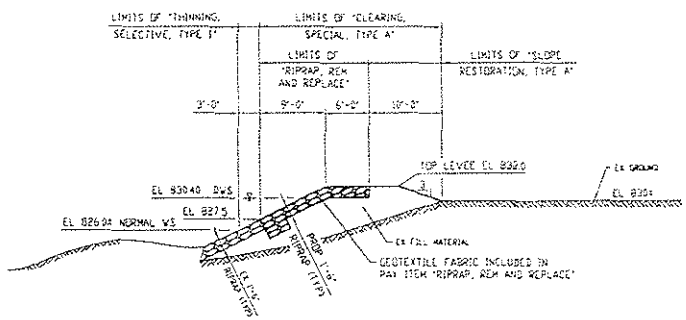
The soil in the riprap section above the dam is not considered contaminated.



TYPICAL RIPRAP SECTION

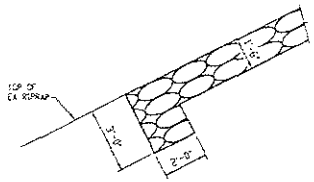
(APPLIES FROM MONROE STREET DAM TO BEGINNING OF CONCRETE LINED CHANNEL)

NOTE
CONTRACTOR SHALL HAVE ADEQUATE AMOUNTS OF SAND AND BAGS AVAILABLE TO RESTORE LEVEE IN THE EVENT THAT FLOOD WATER LEVELS APPROACH DWS DURING RECONSTRUCTION OF LEVEES. INCLUDED IN THE PAY ITEM "MOBILIZATION"



TYPICAL LEVEE SECTION

BETWEEN MONROE ST DAM & BECKMAN ROAD (OLD GOGUAC ST)
(LEFT AND RIGHT BANKS)



RIPRAP TOE DETAIL

MISCELLANEOUS QUANTITIES - LEVEE		
ITEM	UNIT	AMOUNT
Clearing, Special, Type A	Acre	0.98
Erosion Control, Silt Fence	Ft	2032
Riprap, Rem and Replace	Syd	3139
Slope Restoration, Type A	Syd	1622
Weed Control	Acre	2
Thinning, Selective, Type I	Acre	1.05
Embankment, CIP	Cyd	103

NOTES:

THE WORK COVERED BY THESE PLANS INCLUDES CLEARING, RECONSTRUCTION OF LEVEES AND RIPRAP, REPAIR OF CONCRETE CHANNEL, REPAIR AND INSPECTION OF SUBDRAINS AND REPLACEMENT OF FENCING.

THE CONTRACTOR SHALL LOCATE ALL ACTIVE UTILITIES PRIOR TO STARTING WORK AND SHALL CONDUCT HIS OPERATIONS IN SUCH A MANNER AS TO ENSURE THAT THOSE UTILITIES NOT REQUIRING RELOCATION WILL NOT BE DISTURBED.

REFER TO SPECIAL PROVISIONS FOR CLEARING AND RIPRAP.

RECEIVED
MAY 21 2009
LWMD-KALAMAZOO

DEQ-LWMD
File # 13-10-9
APPROVED PLANS
Page 2 of 10
6/24/09

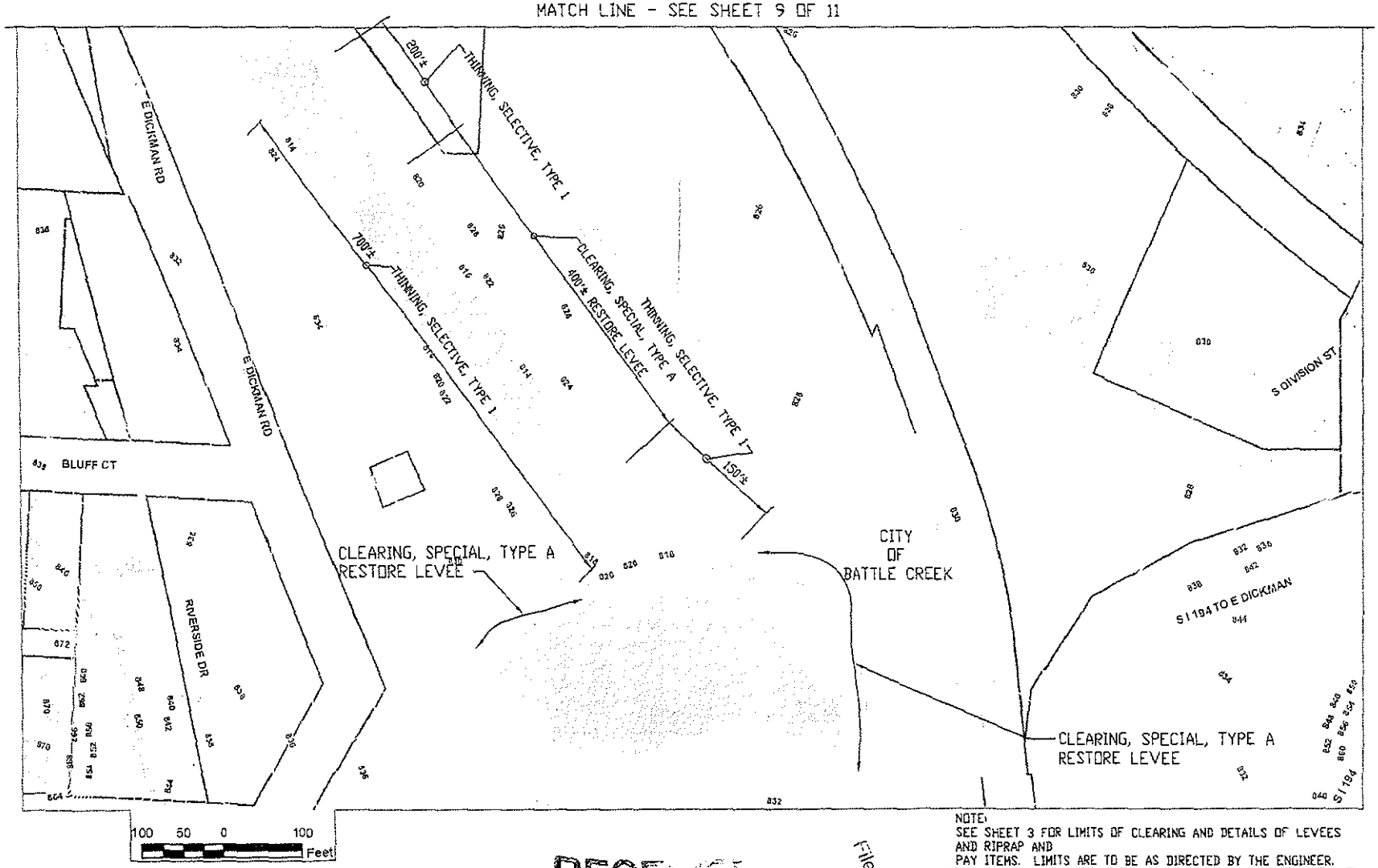
WORK THIS SHEET WITH SHEET 10

HH ENGINEERING LTD.

RIPRAP & LEVEE CHANNEL SECTIONS
KALAMAZOO RIVER FLOOD CONTROL REPAIRS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
04/07/09			BATTLE CREEK	9 OF 11

DATE: 04/07/09 | CORRECTED BY: R.S. SAP, BE | DATE | CHECKED BY: | DATE | CHECKED BY: | FILE NAME: 825typdwg



NOTE:
SEE SHEET 3 FOR LIMITS OF CLEARING AND DETAILS OF LEVEES AND RIPRAP AND PAY ITEMS. LIMITS ARE TO BE AS DIRECTED BY THE ENGINEER.

RECEIVED
MAY 21 2009
LWMD-KALAMAZOO

DEQ-LWMD
File # 09-13-10-P
APPROVED PLANS
Page 9 of 10
6-12-09

HH ENGINEERING LTD.

GENERAL PLAN
KALAMAZOO RIVER CUT-OFF CHANNEL

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
04/07/09			BATTLE CREEK	10 OF 11

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or irideecent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Island
      - Operations Cleanup Recommendation Table
      - Figures (aerials)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

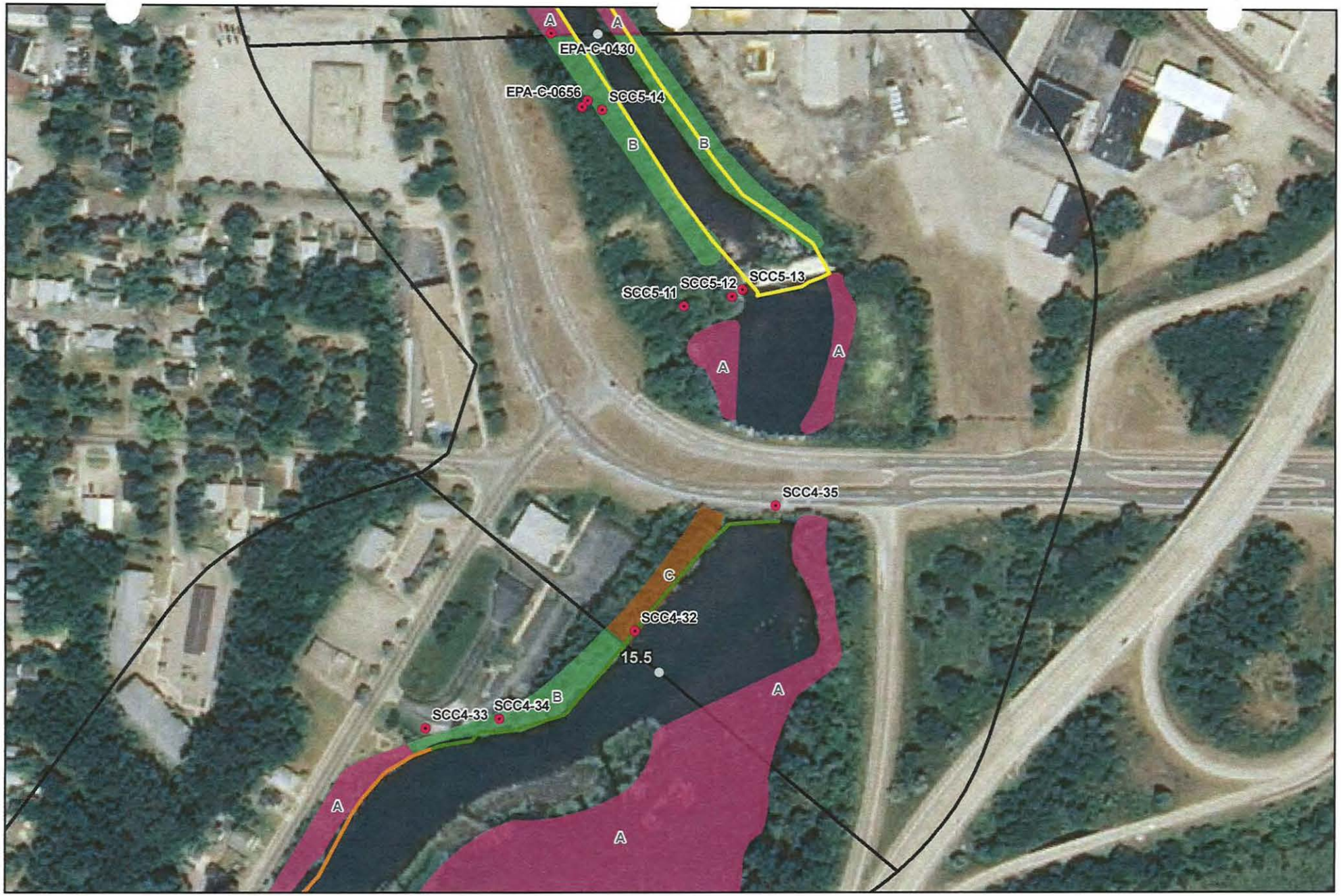
- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

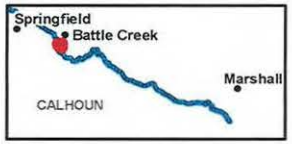
- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANuP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 15.5-15.75 Left Bank While Looking Downstream										
SCC4-32	Shoreline	Shoreline Assessment					Reference point only.		42.31103	-85.18622
SCC4-35	Shoreline	Shoreline Assessment	●		●	●	RDB: view across wetland oiled area liikely to right of purple loose strife plants. Need further assessment. LDB: shoreline oiled. Entry point of culverts oil debris fields. Cut veg. High volume flush & collect oil.		42.31165	-85.18530
SCC5-11	Shoreline	Shoreline Assessment	●	●	●	●	Pooled oil along lilly pad area. Hand snare? Safety issues of dam. Coated vegetation. Cut and remove.		42.31262	-85.18592
SCC5-13	Shoreline	Shoreline Assessment	●		●	●	Riprap with scattered vegetation. Boulders stained with oil.		42.31270	-85.18553





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B BC C D E F G H NO OIL ZONE

Division C: Mile Marker 15.5-15.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

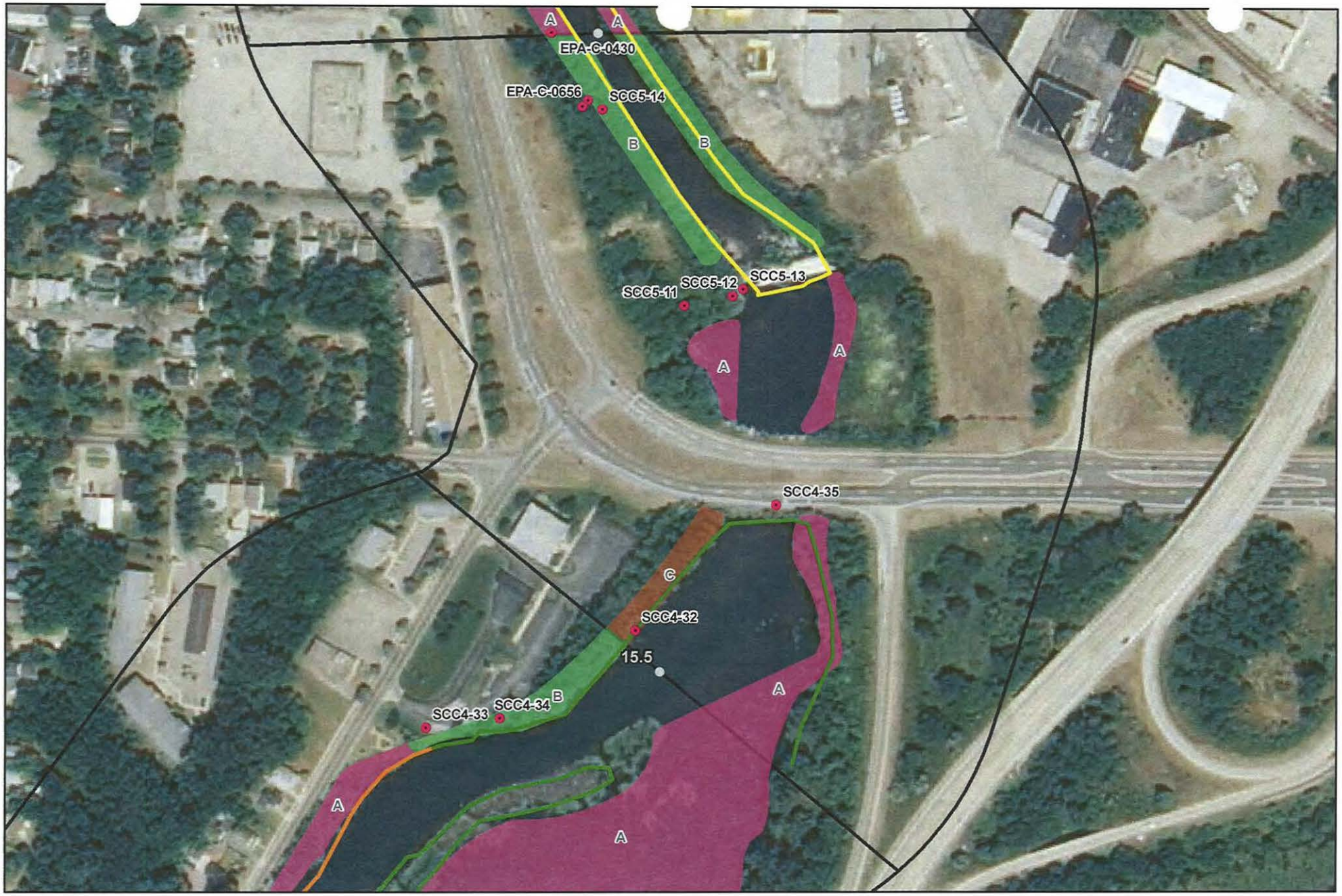
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 15.5-15.75 Island										
EPA-C-0433	Shoreline	SCAT T4 08/30/2010	Overall, sporatic staining on cobble/boulders. Section between Zone A and Zone B looked clean. Zone B access limited by fence along upper bank. Bridge abutment on LDB heavily coated/stained. Water level currently low. Fine sediment when disturbed releases small tar balls to surface of water. Photo 25 stainded and coated veg. near Bank at 15.25. Photo 26 end of segment					Do not remove woody plants greater than 2"diameter as measured	42.31361	-85.18656





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 15.5-15.75 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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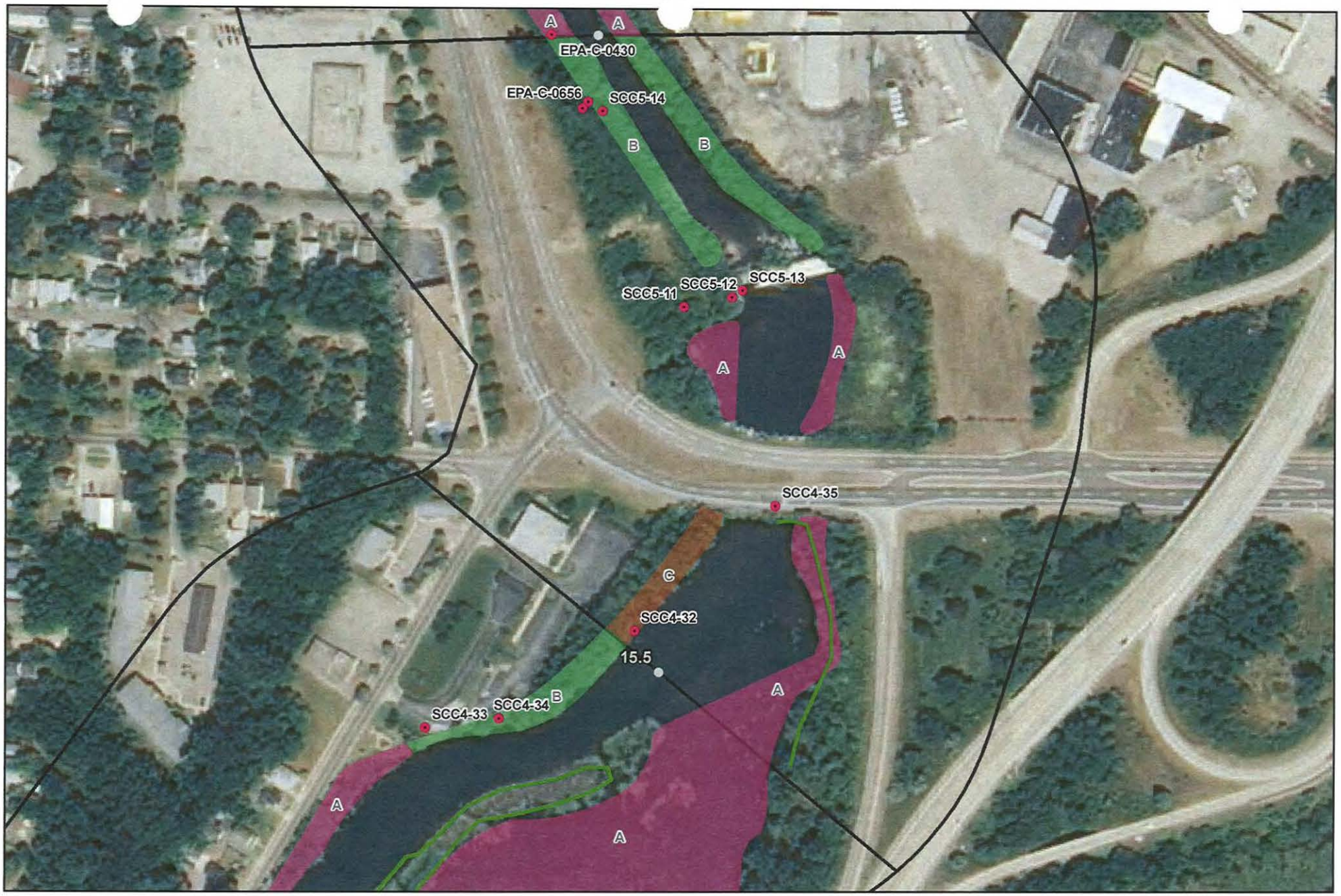
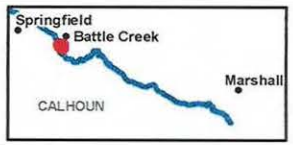
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 15.5-15.75 Right Bank While Looking Downstream										
SCC4-35	Shoreline	Shoreline Assessment	●		●	●	RDB: view across wetland oiled area liikely to right of purple loose strife plants. Need further assessment. LDB: shoreline oiled. Entry point of culverts oil debris fields. Cut veg. High volume flush & collect oil.		42.31165	-85.18530
SCC5-12	Shoreline	Shoreline Assessment	●		●	●	Oiled vegetation along RDB dam side. Note safety issues of dam.		42.31267	-85.18560
SCC5-14	Shoreline	Shoreline Assessment	●		●	●	Riprap & scattered vegetation. Other side of SCC5-13. Cut vegetation. Snare and cut vegetation.		42.31357	-85.18647





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 15.5-15.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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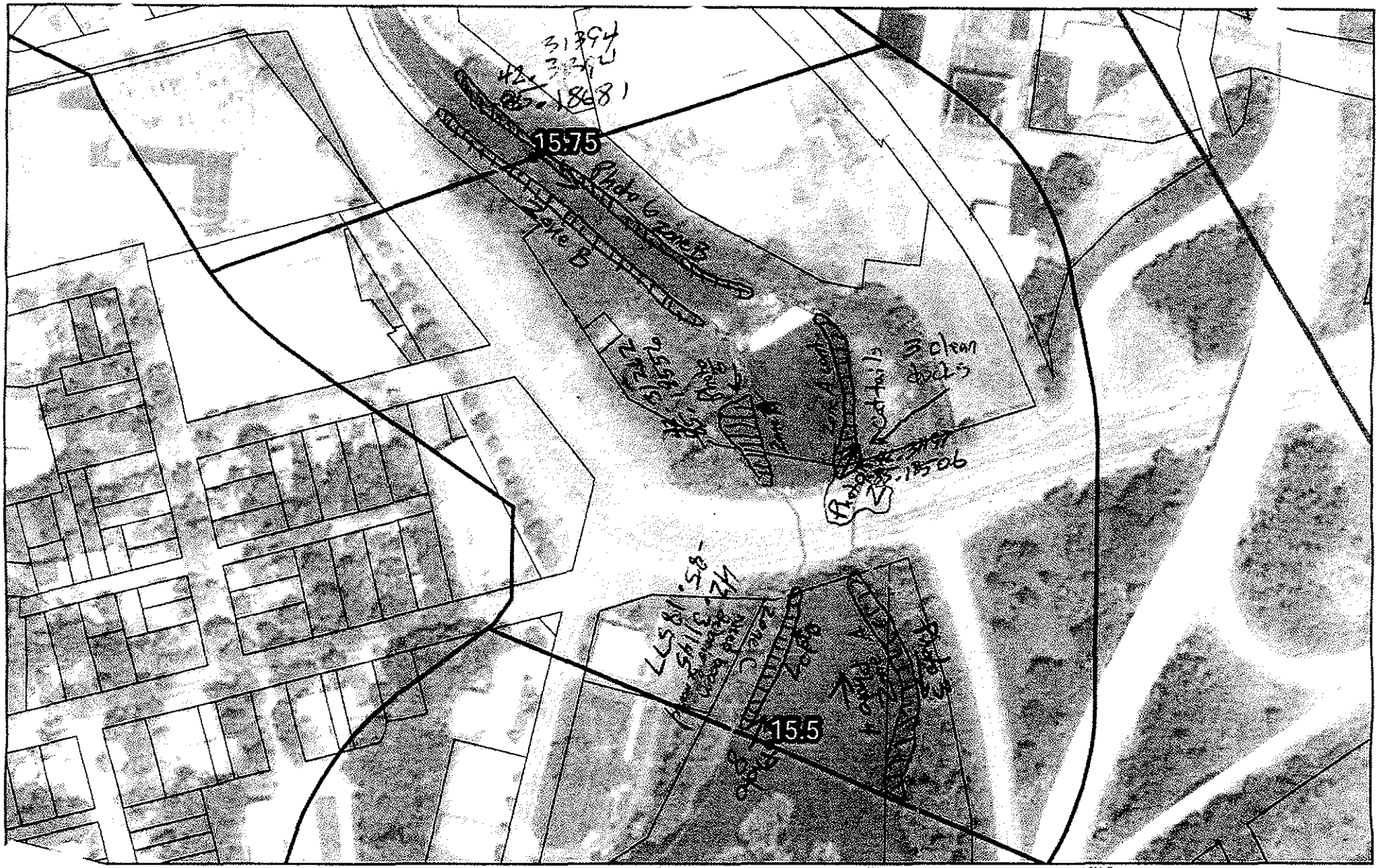
Coordinate System: NAD 1983 State Plane Michigan South Feet



Team 3
3/30/2010

15.5 to 15.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX
Down to Earth Down to Business
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Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/17/10 **Time:** (AM) / PM

Operations Division: C **Segment ID: From** 55 **Start MP to End MP** 5.75 **Segment Length: 0.25 mile**

Bank: (LDB / RDB) ☒ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

Enbridge Inspector: Amy Ruemmler Amy Ruemmler

Division Supervisor(Contractor): Art Slayton

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT Items Reviewed/Complete

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT Items Reviewed/Complete

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT Items Reviewed/Complete

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT Items Reviewed/ Complete

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 09/7/10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 15.5 **Start MP to End MP** 15.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ Island

Weather: Sun/Cloud/Rain/Snow/ Sunny

Field Inspection Team

[redacted]

Enbridge Inspector: [redacted] Chief Vice

Division Supervisor(Contractor): [redacted]

SCAT Reviewed – Description of Clean Up Required

Reviewed items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Inciden alamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 15.5-15.75 Left Bank While Looking Downstream											
Zone A	Shoreline	SCAT T3 9/17/10	Small patches of oiled vegetation in high water					remove oiled vegetation	See Sketch		(Y) / N
Zone B	Shoreline	SCAT T3 9/17/10	Patches of oiled vegetation along shoreline					Remove oile vegetation	See Sketch		(Y) / N

Printed Team Members Name: Mike Van Loan, Kenneth Mroczkowski MDNRE, Less Delrosario EPA
Date: 9/19/10
Comments:

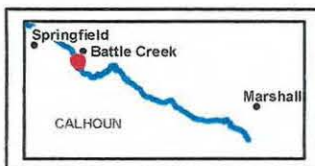
Enbridge Pipeline Release Incident *Iamazoo River Oil Spill*

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 15.5-15.75 Island											
EPA-C-0433	Shoreline	SCAT T4 08/30/2010	Overall, sporatic staining on cobble/boulders. Section between Zone A and Zone B looked clean. Zone B access limited by fence along upper bank. Bridge abutment on LDB heavily coated/stained. Water level currently low. Fine sediment when disturbed releases small tar balls to surface of water. Photo 25 stainded and coated veg. near Bank at 15.25. Photo 26 end of segment					Do not remove woody plants greater than 2"diameter as measured	42.31361	-85.18656	(Y) N

Printed Team Members Name: Mike Van Loan, Kenneth Mroczkowski MDNRE, Russ Delvosario EPA
Date: 9/19/10
Comments:





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B BC C D E F G H NO OIL UNKNOWN ZONE

Team 3 9/17/10

Division C: Mile Marker 15.5-15.75 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System NAD 1983 State Plane Michigan South Feet

1

Enbridge Pipeline Release Inciden. alamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 15.5-15.75 Right Bank While Looking Downstream											
Zone A	Shoreline	SCAT T3 9/17/10	Small patches of oiled vegetation in high water					remove oiled vegetation	See Sketch		(Y) / N
Zone B	Shoreline	SCAT T3 9/17/10	Patches of oiled vegetation along shoreline, rip rap also present					Remove oile vegetation, no recommendation for rip rap	See Sketch		(Y) / N

Printed Team Members Name: Mike Van Loon, Kenneth Mroczkowski MDNRE, Ross Rosario EPA
Date: 9/19
Comments:

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From** 1550 **Start MP to End MP** 1575 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Matt Bodson 9-18-10 Enbridge
Signature MATTBODSON (date)

Eugene Dennis 9-18-2010 EPA
Signature Eugene Dennis EPA, OSC (date)

4. **SCAT Reassessment**

Michael Van Loan 9/19/10 Enbridge
Signature Michael Van Loan (date)

R. del Rosario 9/19/10 EPA
Signature ROSS DEL ROSARIO (date)

Kenneth M. Mroczkowski 9/9/10 MDNRE
Signature Kenneth M. Mroczkowski (date)

5. **EPA**

Jordan Garrard 9/22/10 EPA Division Supervisor
Signature Jordan Garrard (date)

Appendix E
Photographs

Field Photo Log – Segment 15.75



Photo 0906 – Facing east to the culverts at right descending bank.



Photo 0907 – Facing southeast at right descending bank.

Field Photo Log – Segment 15.75



Photo 0910 – Facing northeast at right descending bank near SCC5-12.



Photo 0912 – Facing northwest at left descending bank.

Field Photo Log – Segment 15.75



Photo 0913 – Facing north at left descending bank near SCC5-11.



Photo 0914 – Facing east at left descending bank near SCC5-11.

Field Photo Log – Segment 15.75

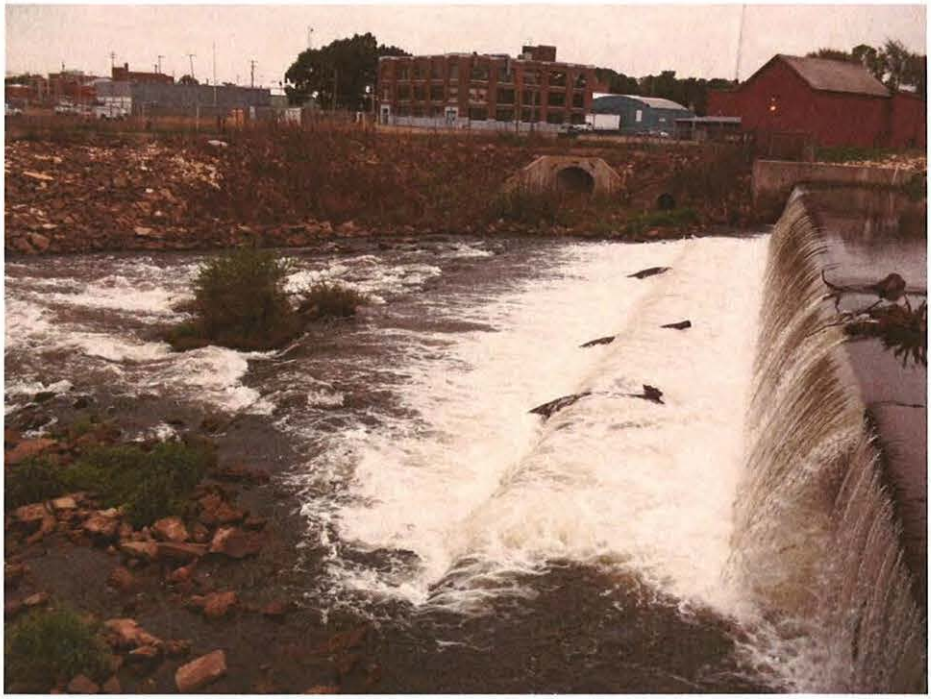


Photo 0916 – Facing east at right descending bank.



Photo 0917 – Facing northwest at left descending bank near SCC5-13.

Field Photo Log – Segment 15.75



Photo 0918 – Facing northwest at left descending bank.



Photo 0922 – Facing northwest looking downstream near SCC5-13.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 16.0 – MP 15.75 to 16.0

Enbridge Energy

September 21, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

During the initial SCAT process, recommendations were made within this segment. Prior to any work being completed during the operations phase, the City of Battle Creek communicated concerns about the release of previously existing contaminants beneath the rip rap within this segment. A procedure for remediation on these hard surfaces was created and follows this report. A re-SCAT was completed to assess issues within the segment not pertaining to hard surfaces and rip rap areas.

During the initial SCAT process recommendations included oiled vegetation and areas of pooled oil that were present in the left descending bank, as well as oil residue in a stormwater culvert. Special consideration was mentioned for 30'x10' sporadic oil staining present on a concrete bank located on the left descending bank and an oiled waterline within the concrete channel.

A re-SCAT was completed on September 19, 2010 to assess issues within the segment not pertaining to hard surfaces and rip rap areas. The shoreline of segment MP 16.0 had light to very light levels of oil staining on the left descending bank. Very light levels of oil staining were present on the right descending bank. No operational focus areas were observed pertaining to non-hard surfaces within this segment.

Actions

- No actions completed within this segment. See attachment following this report.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2, and per Battle Creek recommendations. The following conditions remain:

- Oiled Herbaceous Vegetation and Oiled Rock/Cobble along the left descending bank in SCAT assessment zones A;
- Oiled Herbaceous Vegetation and Oiled Rock/Cobble along the right descending bank in SCAT assessment zones A.

Segment 16 has reached the operational endpoints pursuant for oil recovery per the 5 step process. The appendices attached provide additional details on this segment.

ENBRIDGE OIL SPILL CLEANUP PROCEDURE FOR THE RIPRAP SECTION OF THE FLOOD CONTROL PROJECT WITHIN THE KALAMAZOO RIVER

Description. This work includes removing and replacing riprap on the levees of the City of Battle Creek Flood Control Channel.

Materials. Furnish plain riprap in accordance with Section 916 and furnish geotextile liner, where necessary, in accordance with Section 910 of the 2003 Michigan Department of Transportation Standard Specifications for Construction.

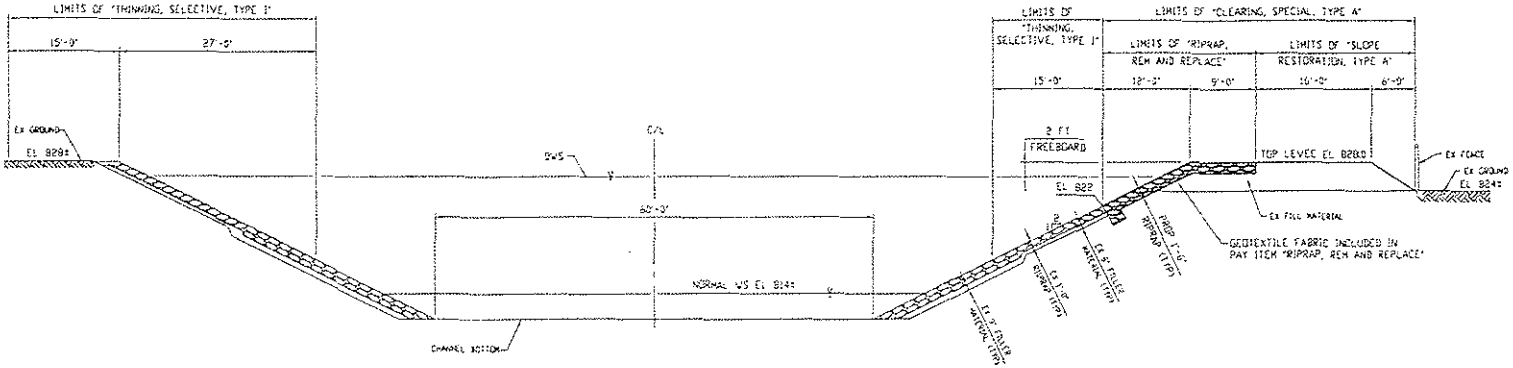
Cleanup. All work shall conform to the Section 813 of the 2003 Michigan Department of Transportation Standard Specifications for Construction, except as modified herein.

All oiled rocks must be removed from the riprap section. Check geotextile fabric for any oil. If oil is present, replace the fabric in accordance to the specifications above.

If areas have only remnants of geotextile fabric, then the levees shall be cleared of vegetation, including root balls, to the limits as shown on the plans. Prior to placing geotextile liner below the riprap, embankment shall be placed so that the reconstructed levee will match the original design elevations.

**Note: The soil beneath the riprap in the area downstream of the Mill Pond Dam is contaminated. Use caution while working. In addition, the soil will need to be removed, stockpiled, tested, and disposed of properly based on test results.*

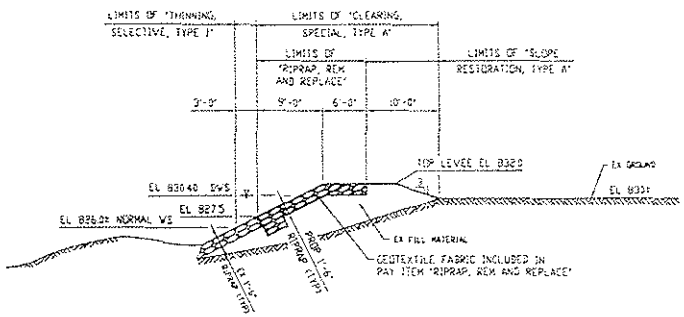
The soil in the riprap section above the dam is not considered contaminated.



TYPICAL RIPRAP SECTION

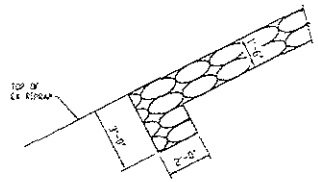
(APPLIES FROM MONROE STREET DAM TO BEGINNING OF CONCRETE LINED CHANNEL)

NOTE
CONTRACTOR SHALL HAVE ADEQUATE AMOUNTS OF SAND AND BAGS AVAILABLE TO RESTORE LEVEE IN THE EVENT THAT FLOOD WATER LEVELS APPROACH D/S DURING RECONSTRUCTION OF LEVEES. INCLUDED IN THE PAY ITEM "MOBILIZATION"



TYPICAL LEVEE SECTION

BETWEEN MONROE ST DAM & DICKMAN ROAD (OLD COCHRAN ST) (LEFT AND RIGHT BANKS)



RIPRAP TOE DETAIL

MISCELLANEOUS QUANTITIES - LEVEE

ITEM	UNIT	AMOUNT
Clearing, Special, Type A	Acre	0.98
Erosion Control, Silt Fence	Ft	2000
Riprap, Rem and Replace	Syd	3129
Slope Restoration, Type A	Syd	1622
Weed Control	Acre	2
Thinning, Selective, Type 1	Acre	1.06
Embankment, CIP	Cyd	150

NOTES:

THE WORK COVERED BY THESE PLANS INCLUDES CLEARING, RECONSTRUCTION OF LEVEES AND RIPRAP, REPAIR OF CONCRETE CHANNEL, REPAIR AND INSPECTION OF SUBDRAINS AND REPLACEMENT OF FENCING.

THE CONTRACTOR SHALL LOCATE ALL ACTIVE UTILITIES PRIOR TO STARTING WORK AND SHALL CONDUCT HIS OPERATIONS IN SUCH A MANNER AS TO ENSURE THAT THOSE UTILITIES NOT REQUIRING RELOCATION WILL NOT BE DISTURBED.

REFER TO SPECIAL PROVISIONS FOR CLEARING AND RIPRAP.

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MAY 21 2009
LWMD-KALAMAZOO

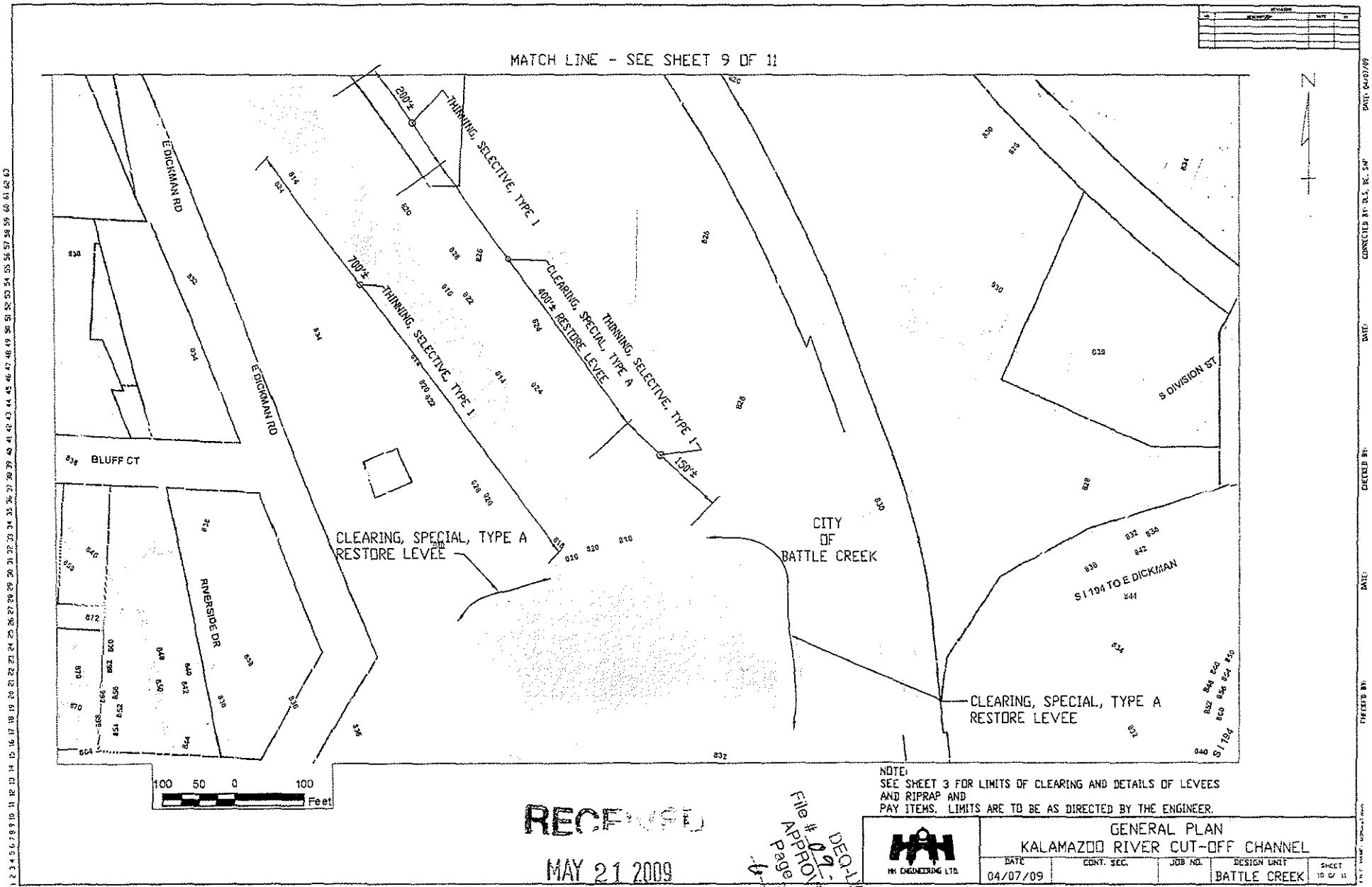
DEQ-LWMD
File # 13-10-P
APPROVED PLANS
Page 2 of 10
5/21/09

WORK THIS SHEET WITH SHEET 10

HH ENGINEERING LTD.

RIPRAP & LEVEE CHANNEL SECTIONS
KALAMAZOO RIVER FLOOD CONTROL REPAIRS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
04/07/09			BATTLE CREEK	9 OF 11



NOTE:
SEE SHEET 3 FOR LIMITS OF CLEARING AND DETAILS OF LEVEES AND RIPRAP AND
PAY ITEMS. LIMITS ARE TO BE AS DIRECTED BY THE ENGINEER.

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MAY 21 2009
LWMD-KALAMAZOO

DEQ-LWMD
File # 09-13-16-1
APPROVED PLANS
Page 9 of 10
4-29-09

HH ENGINEERING LTD.

GENERAL PLAN
KALAMAZOO RIVER CUT-OFF CHANNEL

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
04/07/09			BATTLE CREEK	10 OF 11

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map))

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

. ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 15.75-16 Left Bank While Looking Downstream										
SCC5-16	Shoreline	Shoreline Assessment	●				Oiled waterline edge of concrete channel 500' in length. Eddy collecting sheen. Scoop, snare, sheen only. No veg removal recommendations (safety concerns).		42.31495	-85.18712





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 15.75-16
Left Bank While Looking Downstream

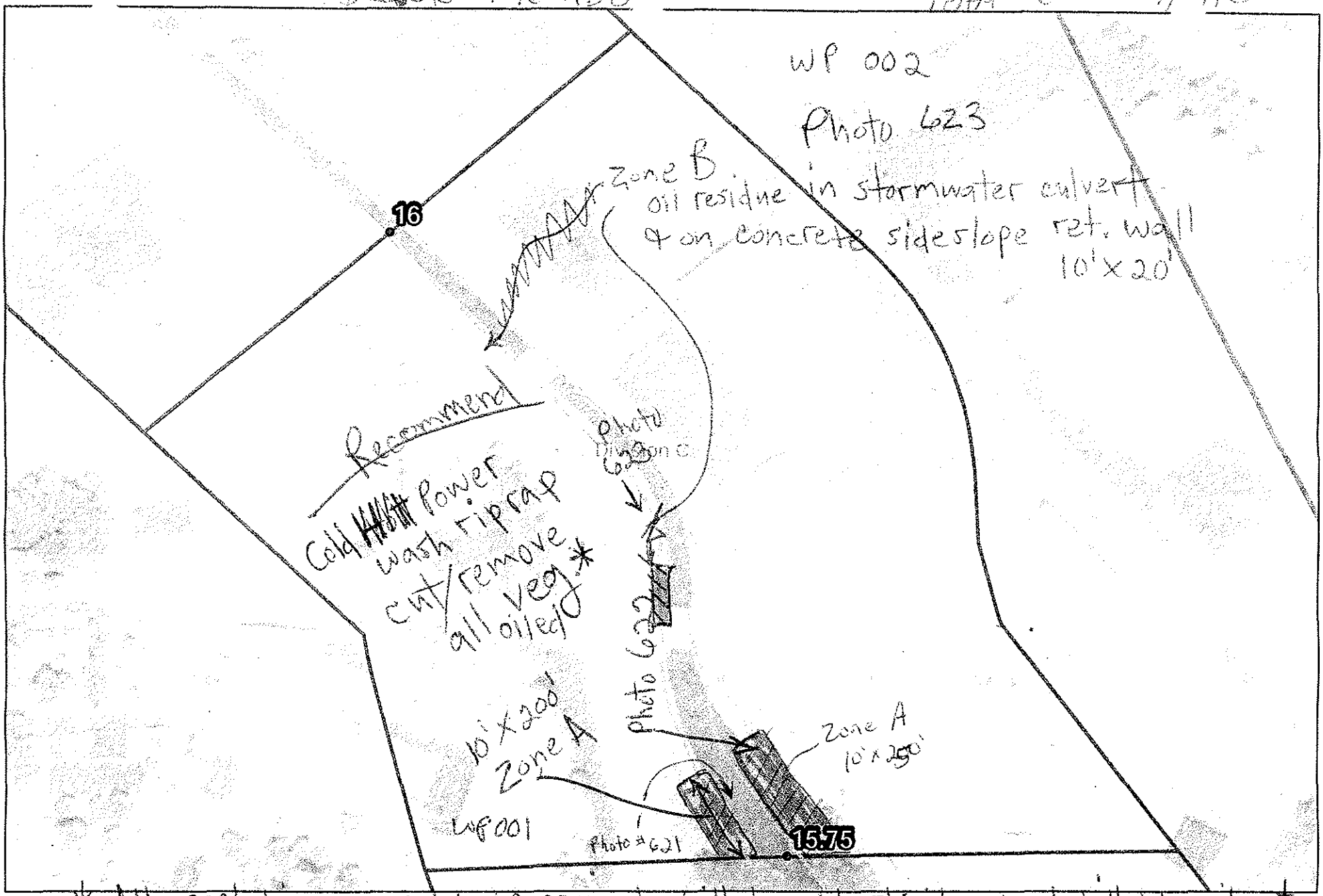
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



* All vegetation appeared to be previously killed w/ herbicides or not killed by oil contam

Springfield
Battle Creek
Marshall

Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

15.75-16

Enbridge Pipelin ... ise Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 15.75-16 Right Bank While Looking Downstream										
SCC5-15	Shoreline	Shoreline Assessment	●		TBD	TBD	Start of channelized river. Riprap coated to right. Base concrete of channel has no visible oil.		42.31415	-85.18698
EPA-C-0430	Shoreline	SCAT T3 08/30/2010	This zone is surrounded by rocks, and there is no vegetation in the area that would be affected by the hot water. The dam is just upstream and would dilute hot water quickly.					Cut vegetation, leave roots. Boom before starting work. Clean up pooled oil.	42.31394	-85.18681

Is this a zone?

- Both of these GPS points should be on the left descending bank fans
- ~~No sketch~~





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 15.75-16
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

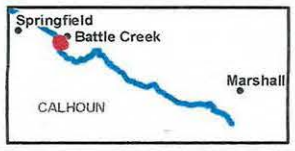
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

Division C: Mile Marker 15.75-16
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/18/10 **Time:** (AM) / PM

Operations Division: C **Segment ID: From** 15.75 **Start MP to End MP** 16.0 **Segment Length: 0.25 mile**

Bank: (LDB / RDB) ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/(Rain)/Snow/_____

Field Inspection Team

Enbridge Inspector: Amy Ruemmler Amy Ruemmler

Division Supervisor(Contractor): Art Slyton Art Slyton

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Corner of Fountain and Davenport streets area approximately 30' x 10' has sparatic oil staining on concrete bank. (pressure washing would probably take care of it.)

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Reviewed SCAT areas/complete

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Reviewed SCAT areas/Complete

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Reviewed SCAT areas/complete

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 09/18/10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 15.75 **Start MP to End MP** 16.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Cloudy

Field Inspection Team

Enbridge Inspector: Chad Via

Division Supervisor(Contractor): Art Slayton

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incider Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 15.75-16 Left Bank While Looking Downstream											
							No operational focus areas observed	No further Action Required			Y/N

Printed Team Members Name: Kenneth Mraczkowski, MDNRE, Mike Van Loan Enbridge, Ross Delrosario EPA
Date: 9/19/10
Comments:

	Enbridge Pipeline Release Incide			*Kalamazoo River Oil Spill*							
	SCAT REASSESSMENT SHEET										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 15.75-16 Right Bank While Looking Downstream											
							No operational focus areas observed	No further Action Required			Y/N

Printed Team Members Name: Kenneth Mroczkowski MDNRE, Mike Van Loan Enbridge, Ross Del Rosario EPA
Date: 9/19/10
Comments:

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From** 15.75 **Start MP to End MP** 16.00 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☑

3. **Inspection**

Matt Bordon 9-18-10 Enbridge
Signature MATT BORDON (date)

Eugene Dennis 9-18-2010 EPA
Signature Eugene Dennis, EPA OSC (date)

4. **SCAT Reassessment**

Michael Van Loan 9/19/10 Enbridge
Signature Michael Van Loan (date)

R. del Rosario 9/19/10 EPA
Signature ROSS DEL ROSARIO (date)

Kenneth M. Mroczkowski 9/19/10 MDNRE
Signature Kenneth M. Mroczkowski (date)

5. **EPA**

Jordan Garrard 9/22/10 EPA Division Supervisor
Signature Jordan Garrard (date)

Appendix E
Photographs

Field Photo Log – Segment 16.0



Photo 0923 – Facing northwest down river near SCC5-15.



Photo 0927 – Facing north down river near SCC5-15.

Field Photo Log – Segment 16.0



Photo 0928 – Facing south down river.

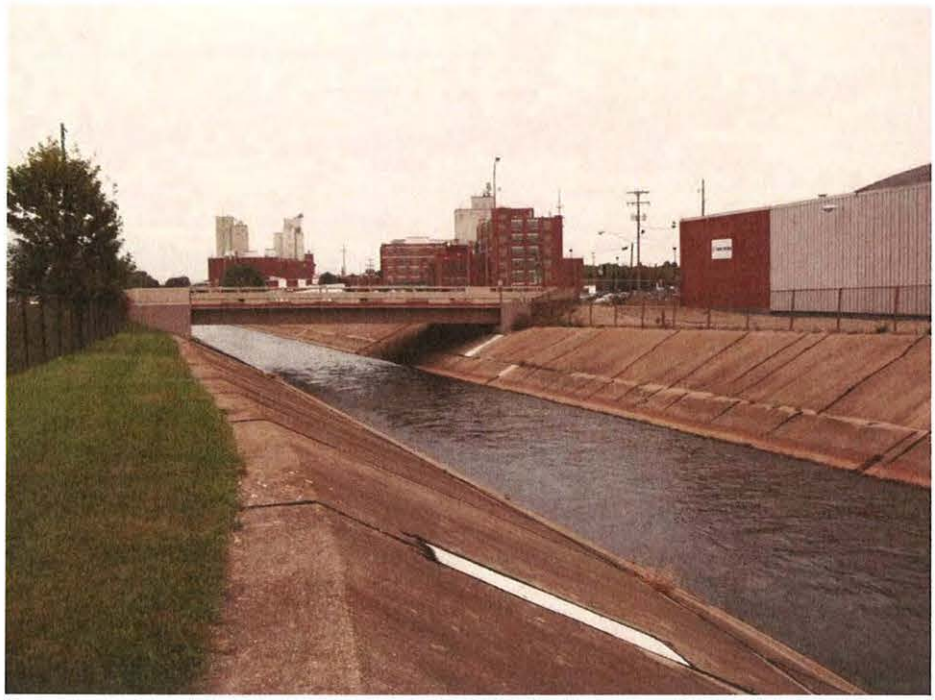


Photo 0930 – Facing north down river.

Field Photo Log – Segment 16.0

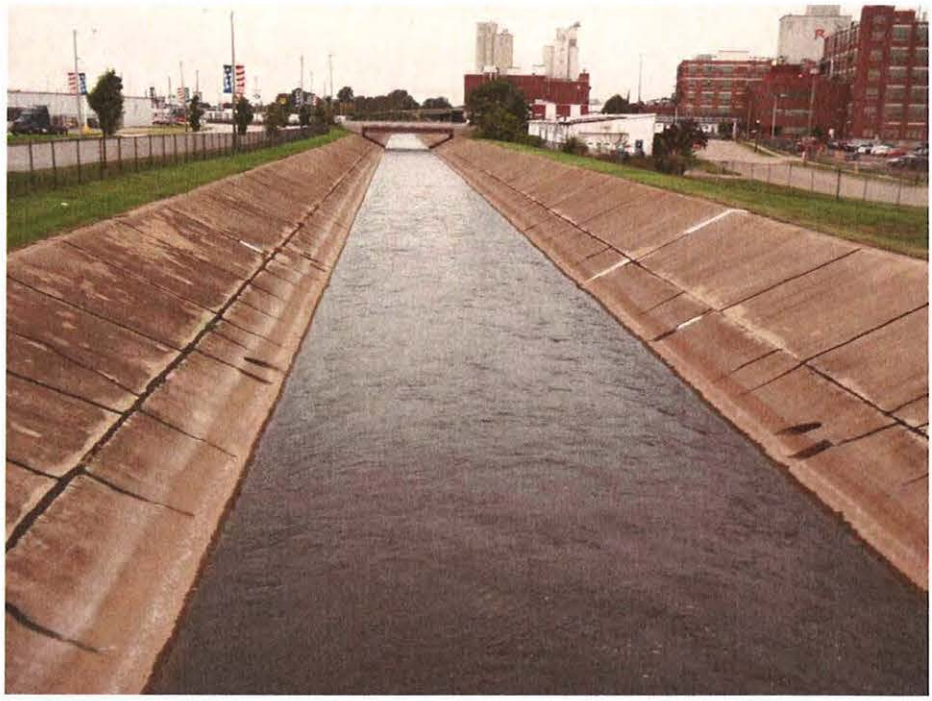


Photo 0931 – Facing northwest down river.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 16.25 – MP 16.0 to 16.25

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 16.25 had very light oiling on the left descending bank and very light oiling on the right descending bank. The overbank areas of both the left and right banks contained no operational focus areas requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the SCAT assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods.

Outcome

Segment 16.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
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      - Figures (aerials and sketch map)

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      - Operations Clean-up Recommendation Table
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  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
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  - Contains signatory approvals and depicts progress of the segment through the 5-step process

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Sediment Types

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B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
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P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
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Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

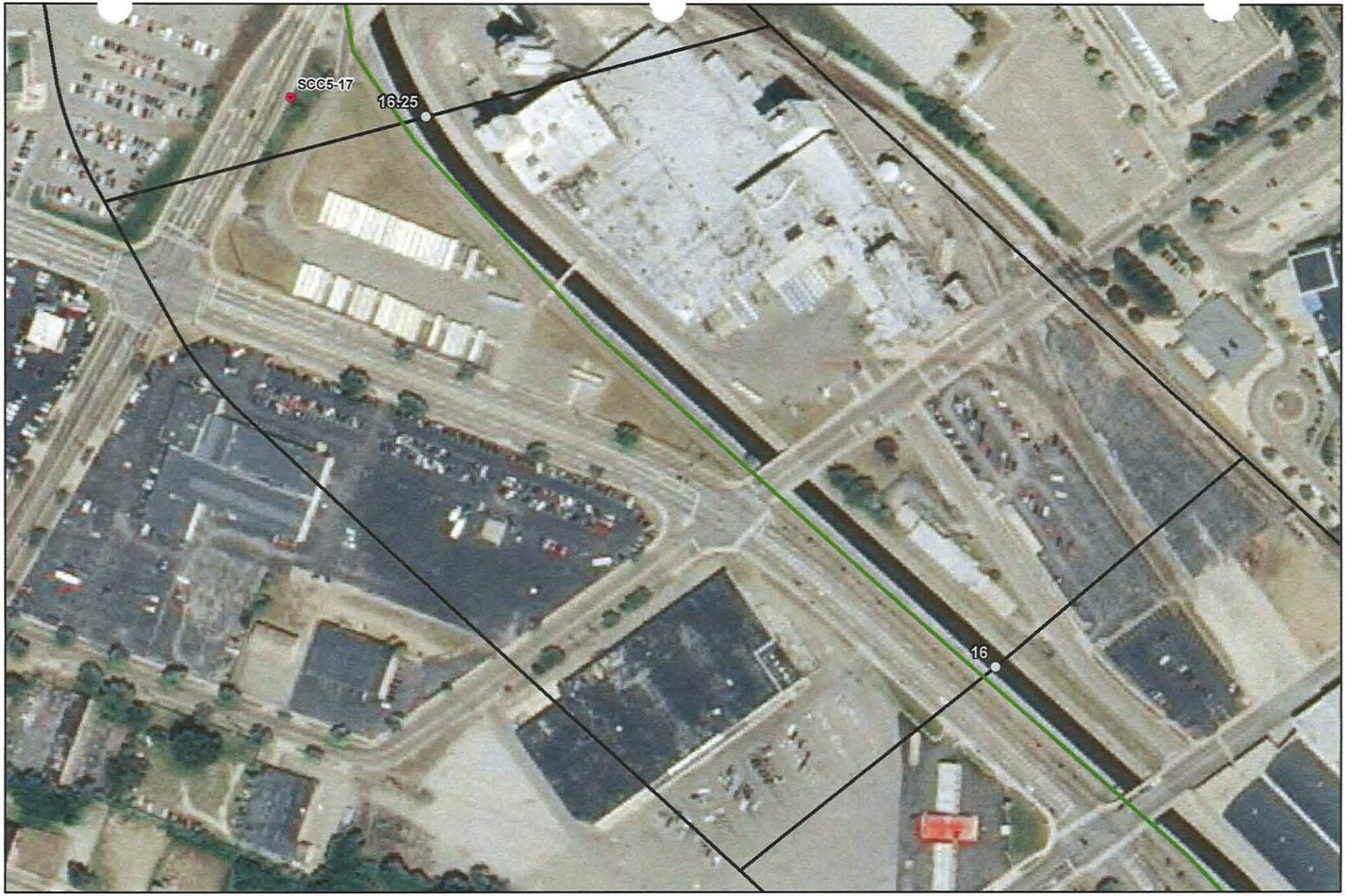
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release I. ent - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 16-16.25 Left Bank While Looking Downstream										
No Operational Focus Areas identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 16-16.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

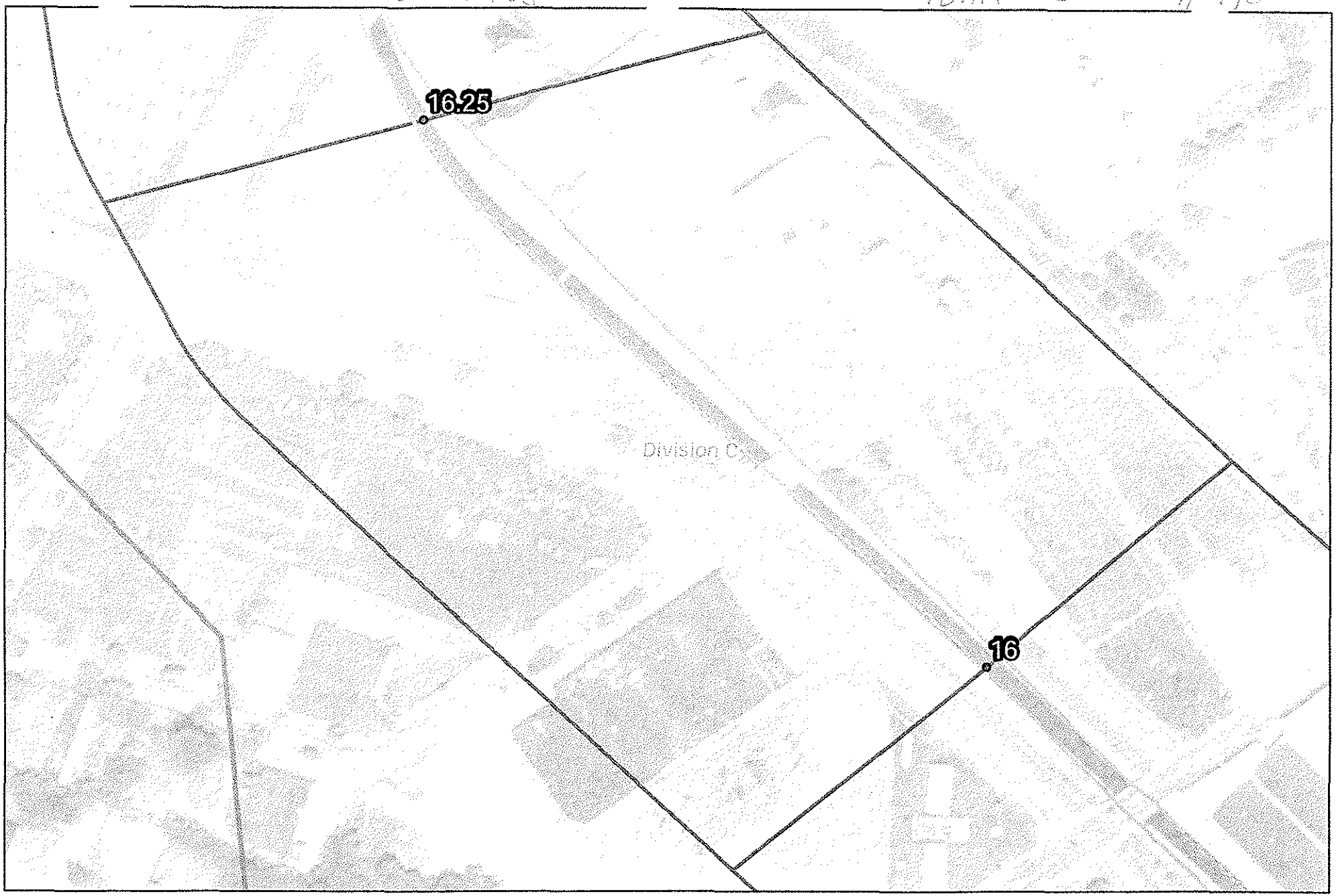
0 75 150 Feet

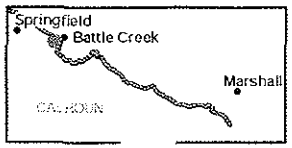
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

16-16.25

Enbridge F e Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

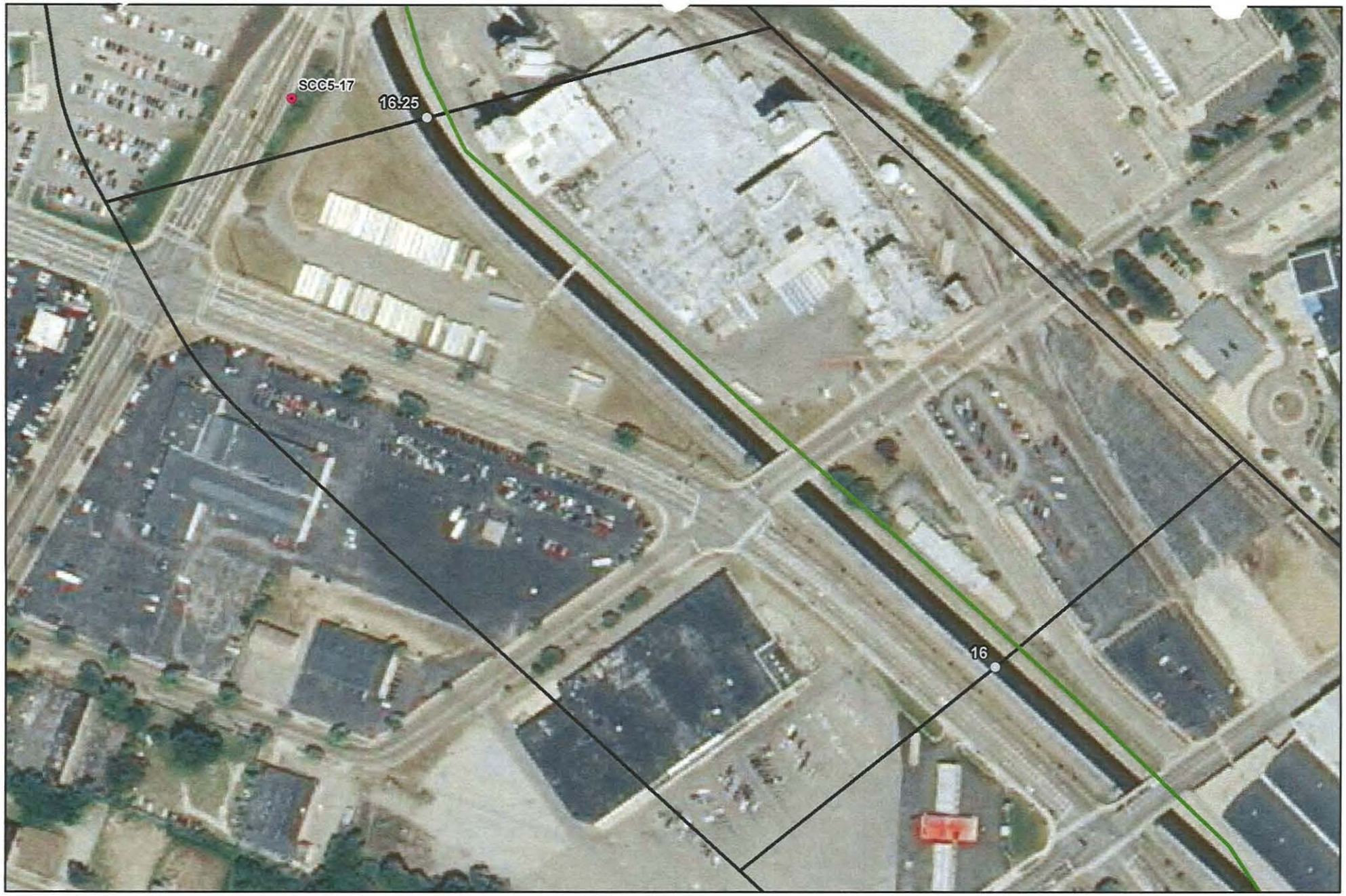
www.entrix.com

Coord Plan: System: NAD 1983 State in South Feet

Enbridge Pipeline Release In - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 16-16.25 Right Bank While Looking Downstream										
No Operational Focus Areas identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 16-16.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9-14-10 Time: AM / PM

Operations Division: 1660 Segment ID: From 160 Start MP to End MP 16.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor): STEVE Turner

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recomendations

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recommendations

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-14-10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 16.0 **Start MP to End MP** 16.25 **Segment Length: 0.25 mile**

Bank: (LDB) / (RDB) ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

[redacted]

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

After reviewing the SCAT report the RDB + LDB required no action

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

None

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 16-16.25 Left Bank While Looking Downstream											
No Operational Focus Areas identified.											

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 16-16.25 Right Bank While Looking Downstream											
No Operational Focus Areas identified.											

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION **Operations Division:** C **Segment ID: From MP** 16.0 **to MP** 16.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☑

3. **Inspection**

[signature] 15-Sept-10 Enbridge
Signature (date)

[signature] 9-15-2010 EPA
Signature (date)
Eugene Dennis, EPA OSC

4. **SCAT Reassessment**

[signature] 9/17/10 Enbridge
Signature Glenn Vanderwal (date)

[signature] 9/17/10 EPA
Signature HOWARD PITAM (date)

[signature] 9/17/10 MDNRE
Signature (date)
Christopher Clampitt

5. **EPA**

[signature] 9/21/10 EPA Division Supervisor
Signature (date)
Jordan Garrard

Appendix E
Photographs

Field Photo Log – Segment 16.25



Photo 0794 – Facing northwest looking at both left and right descending banks.



Photo 0796 – Facing northwest looking at both left and right descending banks.

Field Photo Log – Segment 16.25

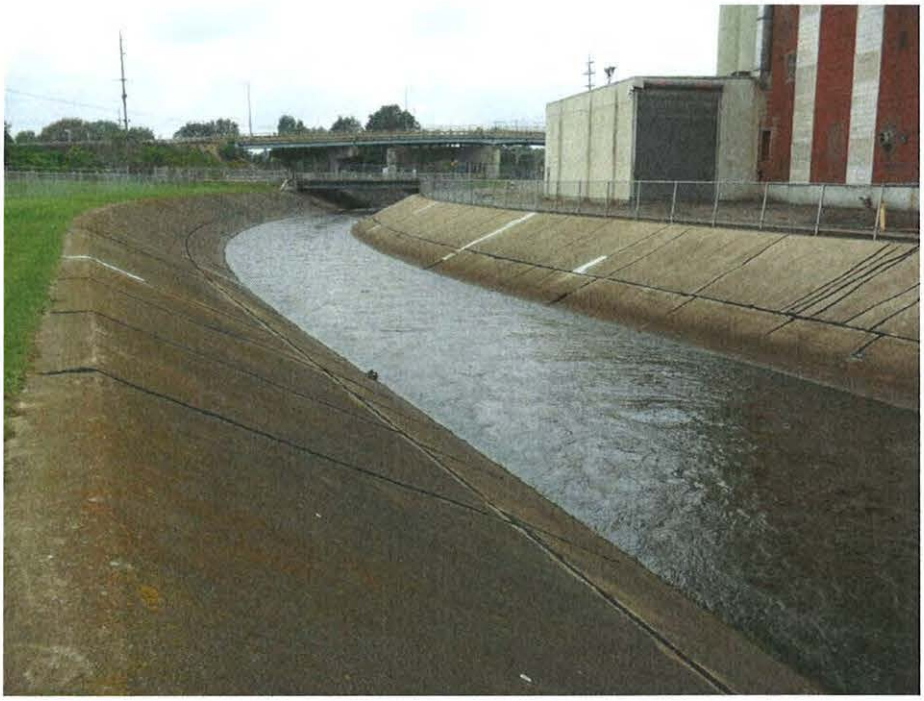


Photo 0798 – Facing northwest looking at both left and right descending banks.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 16.5 – MP 16.25 to 16.5

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP-16.5 had very light oiling on the left descending bank, including oil accumulation that was observed in the eddy below the bridge within the segment. The island within the segment and right descending bank both contained very light oiling. There were no observational focus areas identified on the overbanks within the segment.

Actions

The shoreline clean-up activities within Segment 16.5 consisted of the following:

- Accumulated oil removal through boom deployment with snare and capture methods.

Outcome

Segment 16.5 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill Clean-up Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials and sketch map)

    - Right Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank – Reassessment Conclusion Table
    - Right Descending Bank – Reassessment Conclusion Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

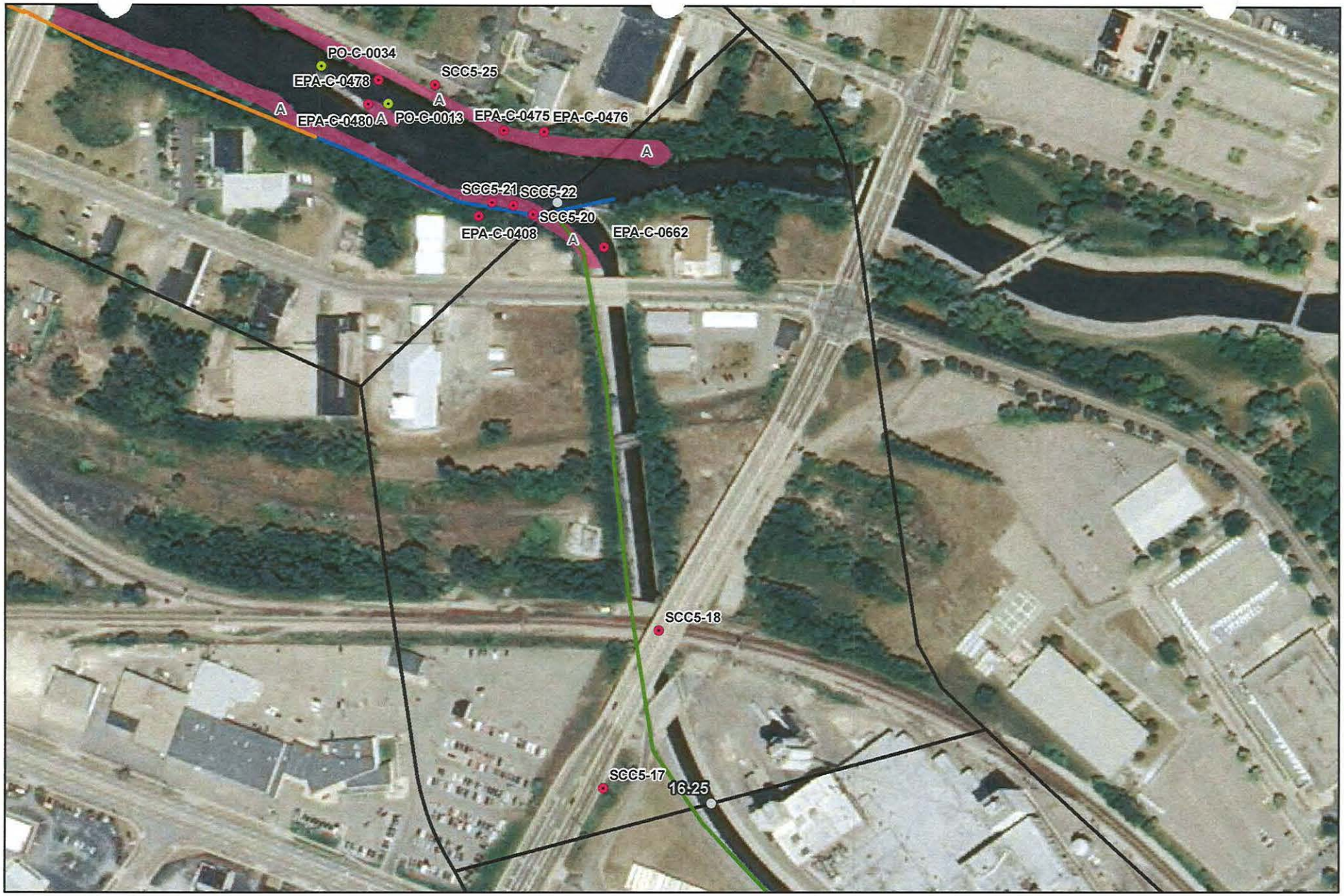
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release I… …nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 16.25-16.5 Left Bank While Looking Downstream										
SCC5-17	Shoreline	Shoreline Assessment				●	Oil accumulation in eddy below bridge. Snare and collect.		42.31938	-85.19343





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B BC C D E F G H NO OIL ZONE

Division C: Mile Marker 16.25-16.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

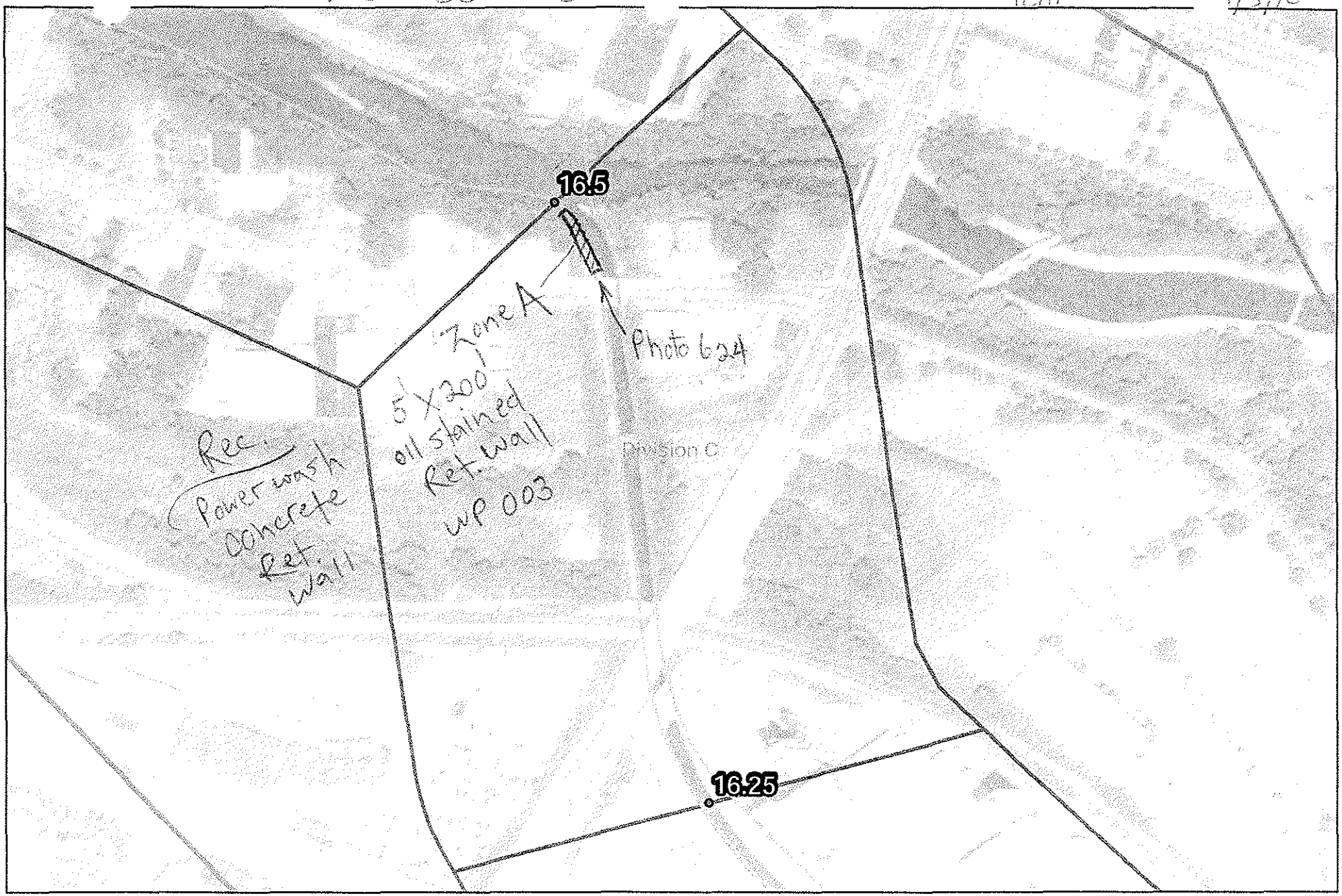
ENTRIX
www.entrix.com

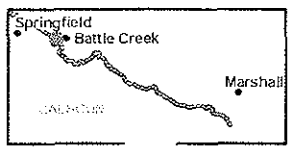
Coordinate System: NAD 1983 State Plane Michigan South Feet

16.5 CDB + KDB

Team #6

9/3/10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

16.25-16.5

Enbridge E e Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

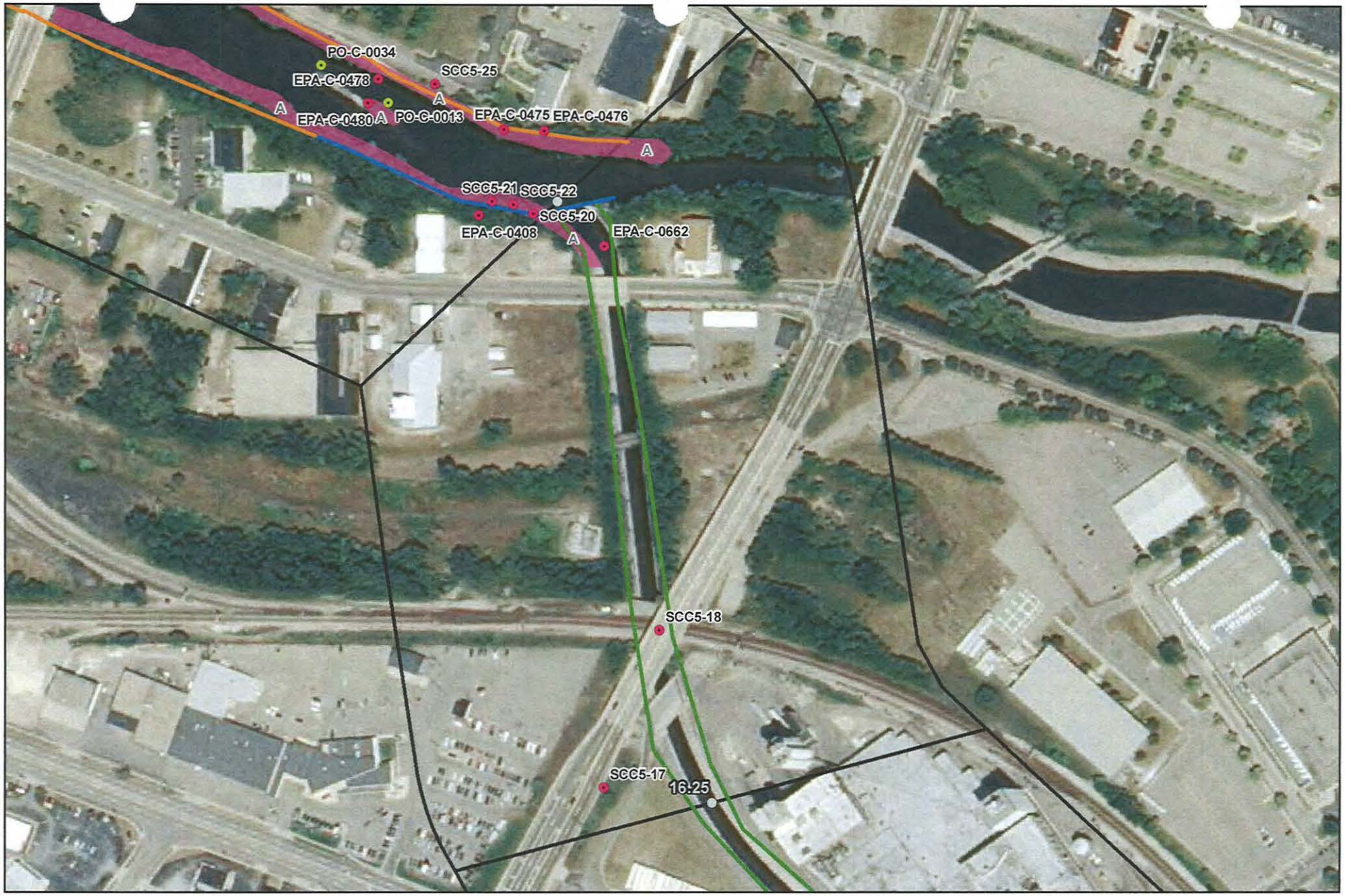
ENTRIX

www.entrix.com

Enbridge Pipeline Release In - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 16.25-16.5 Island										
SCC5-18	Shoreline	Shoreline Assessment					Cement channel by Ralston Co. Channel fairly free of oils.	No recommendations.	42.32028	-85.19302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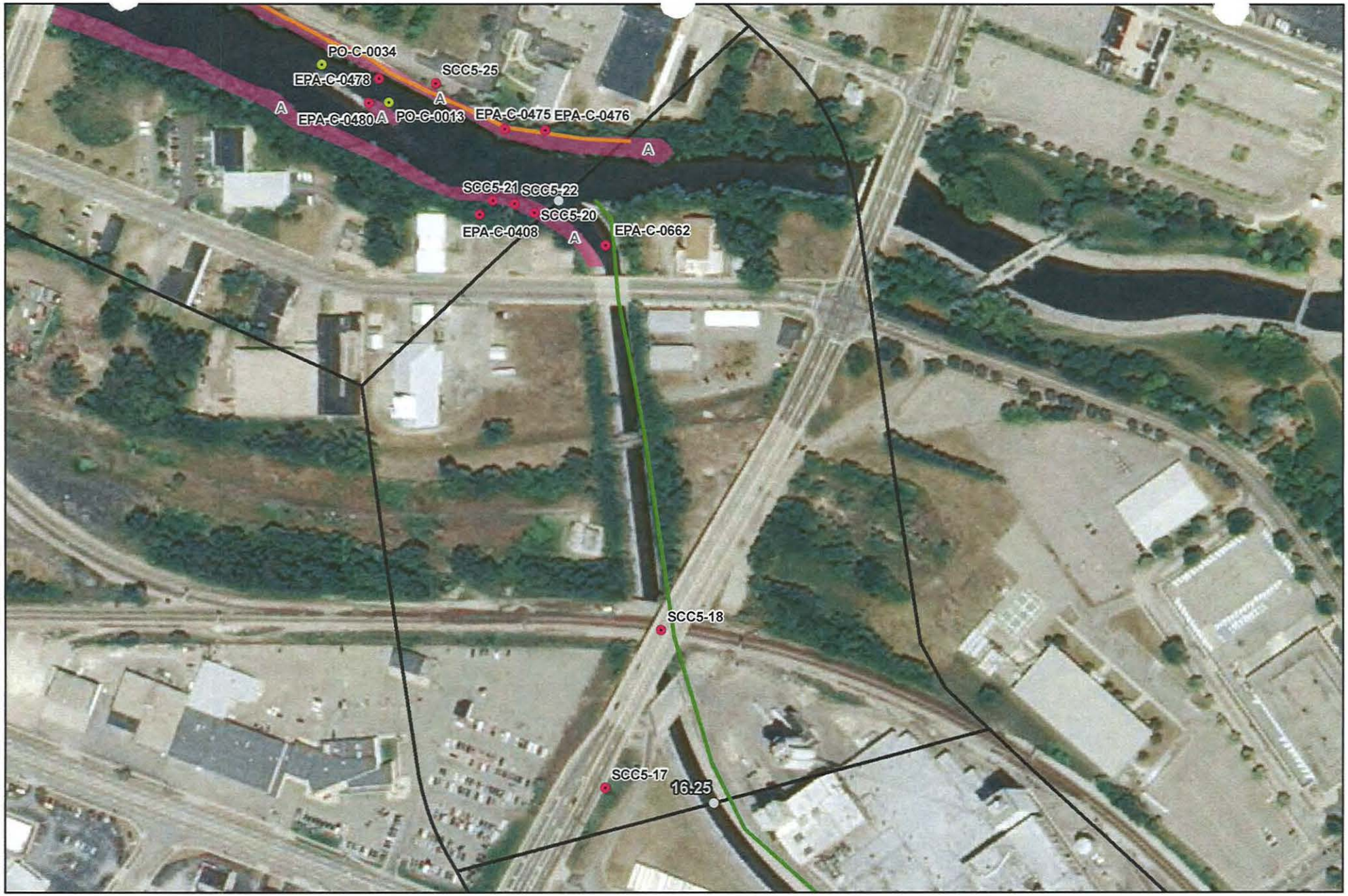
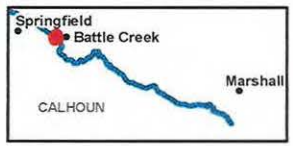
EPA-C-0478
SCC5-25
A
EPA-C-0480
A
PO-C-0013
EPA-C-0475
EPA-C-0476
A
SCC5-21
SCC5-22
SCC5-20
EPA-C-0408
A
EPA-C-0662
SCC5-18
SCC5-17
16.25
Springfield
Battle Creek
Marshall
CALHOUN
River Quarter Miles
Operational Focus Area
Pooled Oil
Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area
A
B
BC
C
D
E
F
G
H
NO OIL ZONE
Division C: Mile Marker 16.25-16.5 Island
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill
0
75
150
Feet
Source: Aerial Photography: USDA, 2009.
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In[illegible]nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 16.25-16.5 Right Bank While Looking Downstream										
EPA-C-0475	Channel	SCAT T2 08/29/2010	GPs is taken at end of segment 16.5; photo 564 is looking upstream from milepost 16.5					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.32313	-85.19425





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division C: Mile Marker 16.25-16.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9.14.10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 16.25 **Start MP to End MP** 16.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature] STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recommendations

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

No Recomendations

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-17-10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 16.25 **Start MP to End MP** 16.5 **Segment Length: 0.25 mile**

Bank: (LDB) / (RDB) ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

[redacted]

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

After reviewing the SCAT report the RDB had no recommendations and the LDB needs a snare to collect debris.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected this area and all clean up is complete according to the SCAT recommendations.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 16.25-16.5 Left Bank While Looking Downstream											
SCC5-17	Shoreline	Shoreline Assessment				•	Oil accumulation in eddy below bridge. Snare and collect.		42.31938	-85.19343	(Y) / N

Printed Team Members Name: Christopher Clamp, MI, DNRE
Howard Pham, EPA
Glen Vandewalle, Enbridge
Date: 9/17/10
Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 16.25-16.5 Island											
SCC5-18	Shoreline	Shoreline Assessment					Cement channel by Ralston Co. Channel fairly free of oils.	No recommendations.	42.32028	-85.19302	(Y) / N

Printed Team Members Name: Christopher Clamp, DNRE
Howard Phan USEPA
Glen Vandenbler, Enbridge
Date: 9/17/14
Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 16.25-16.5 Right Bank While Looking Downstream											
EPA-C-0475	Channel	SCAT T2 08/29/2010	GPs is taken at end of segment 16.5; photo 564 is looking upstream from milepost 16.5					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.32313	-85.19425	Y / N

Printed Team Members Name: Christopher Claypitt, DNRE
Date: 9/17/10
Comments: Howard Phan, EPA
Glen Vandewater, Enbridge

EPA-C-0662 (9/3) No comment Please refer to Kalamazoo Enbridge Oil Cleanup Methods 42.32246 -85.19346 Y / N

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 16.25 **to MP** 16.50 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

15-Sept-10
Signature (date) Enbridge

9-15-2010
Signature (date) Eugene Dennis, EPA OSC EPA

4. **SCAT Reassessment**

9/17/10
Signature Glenn Vandervort (date) Enbridge

9/17/10
Signature HOWARD PITTMAN (date) EPA

9/17/10
Signature Christopher Clampitt (date) MDNRE

5. **EPA**

9/21/10
Signature Jordan Garrard (date) EPA Division Supervisor

Appendix E
Photographs

Field Photo Log – Segment 16.50



Photo 0802 – Looking north at left and right descending banks.



Photo 0804- Looking northwest at left and right descending banks.

Field Photo Log – Segment 16.50



Photo 0805 – Looking north toward the right descending bank.

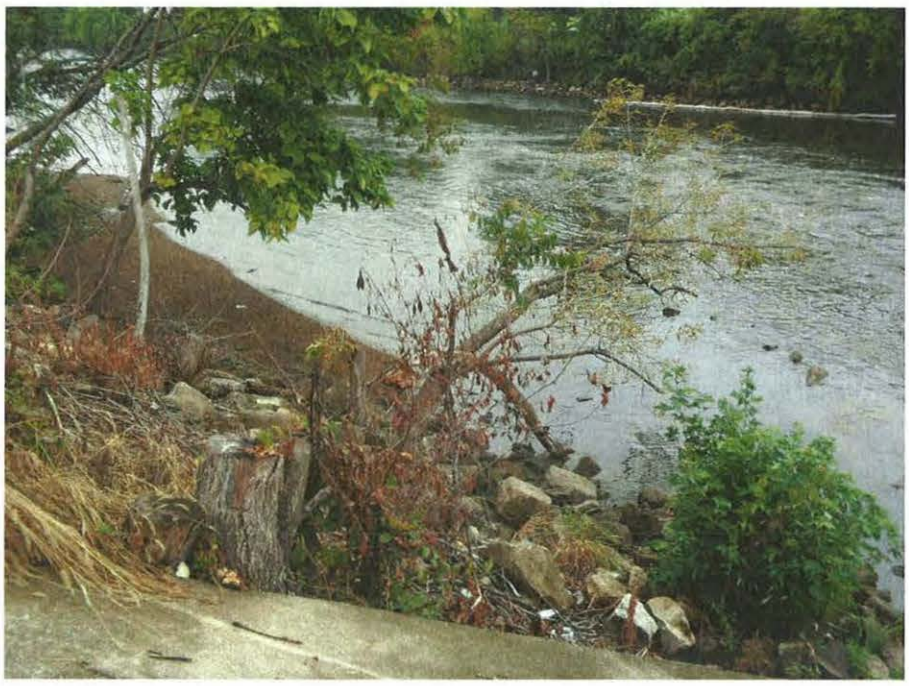


Photo 0806 – Looking northwest toward the left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 16.75 – MP 16.50 to 16.75

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 16.75 had moderate to no oiling, stained rocks, oiled vegetation and oiled sand on the left descending bank. One island and one sand bar were present with oiled debris, sand, rocks, vegetation and pooled oil observed. Moderate oiling, oiled rip-rap and oiled vegetation were observed on the right descending bank. The overbank contained no areas requiring clean-up.

Actions

Free oil was recovered from along the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 16.75 consisted of the following:

- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs;
- High volume low pressure flushing for free oil removal with downstream booming, absorbent booms and pads;
- Removal of oiled debris;
- Removal of oiled sand
- High pressure flushing of man-made structures and/or rocks.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along left descending bank near MP 16.5, and on island;
- Oiled rock/cobble along right descending bank near MP 16.5 and 16.75.

Segment 16.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Island/Sandbar
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table
    - Island/Sandbar-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

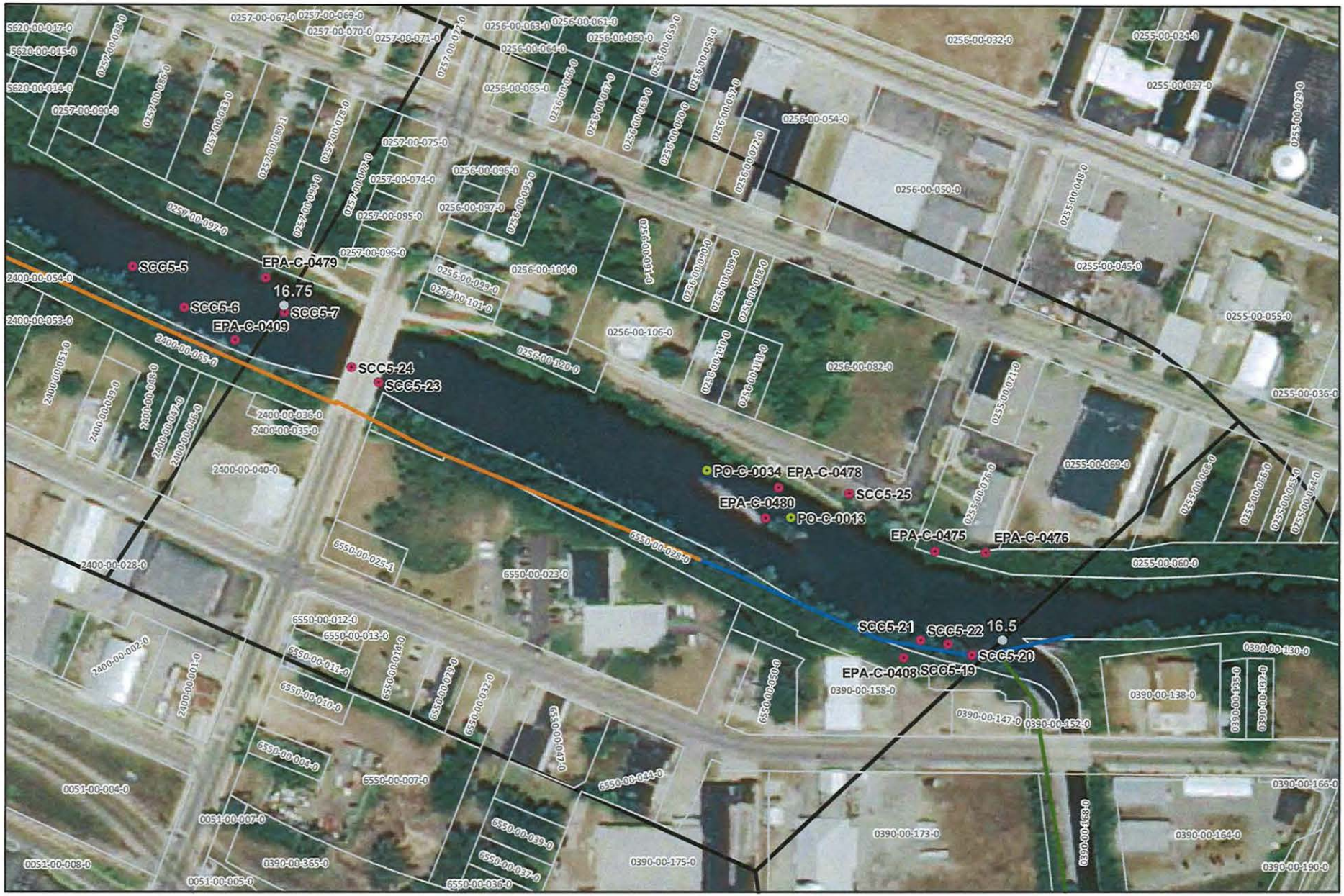
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

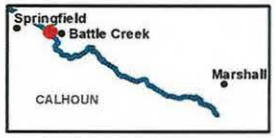
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 16.5-16.75 Left Bank While Looking Downstream										
SCC5-20	Shoreline	Shoreline Assessment	●		●	●	Oiled boulders and water behind bank. Oiled bank & vegetation. Vacuum/high pressure wash & collect. Snare. Note swift current in center (safety).		42.32265	-85.19402
SCC5-21	Shoreline	Shoreline Assessment	●		●	●	LDB highly oiled sandy shore 10' inland. Bank vegetation coated with oil. Dig up sand and cut veg.		42.32272	-85.19433
EPA-C-0408	Shoreline	SCAT T1 08/30/2010	Sand BAR at 16.5 has tar covered soil. GPS point at pools of oil. Rocks are coated, woody debris has tar coating. Some overhanging veg. that is oiled. Also surveyed by foot.					Manual removal (scraping or wiping with sorbents on oil < 0.1 cm), high pressure cold water wash, leave unscrapable oil in place, warm water power wash on rocks, rake off soil at sand beach @ 16.5, cut and remove overhanging vegatation, Manually remove pooled tar	42.32264	-85.19444





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 16.5-16.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

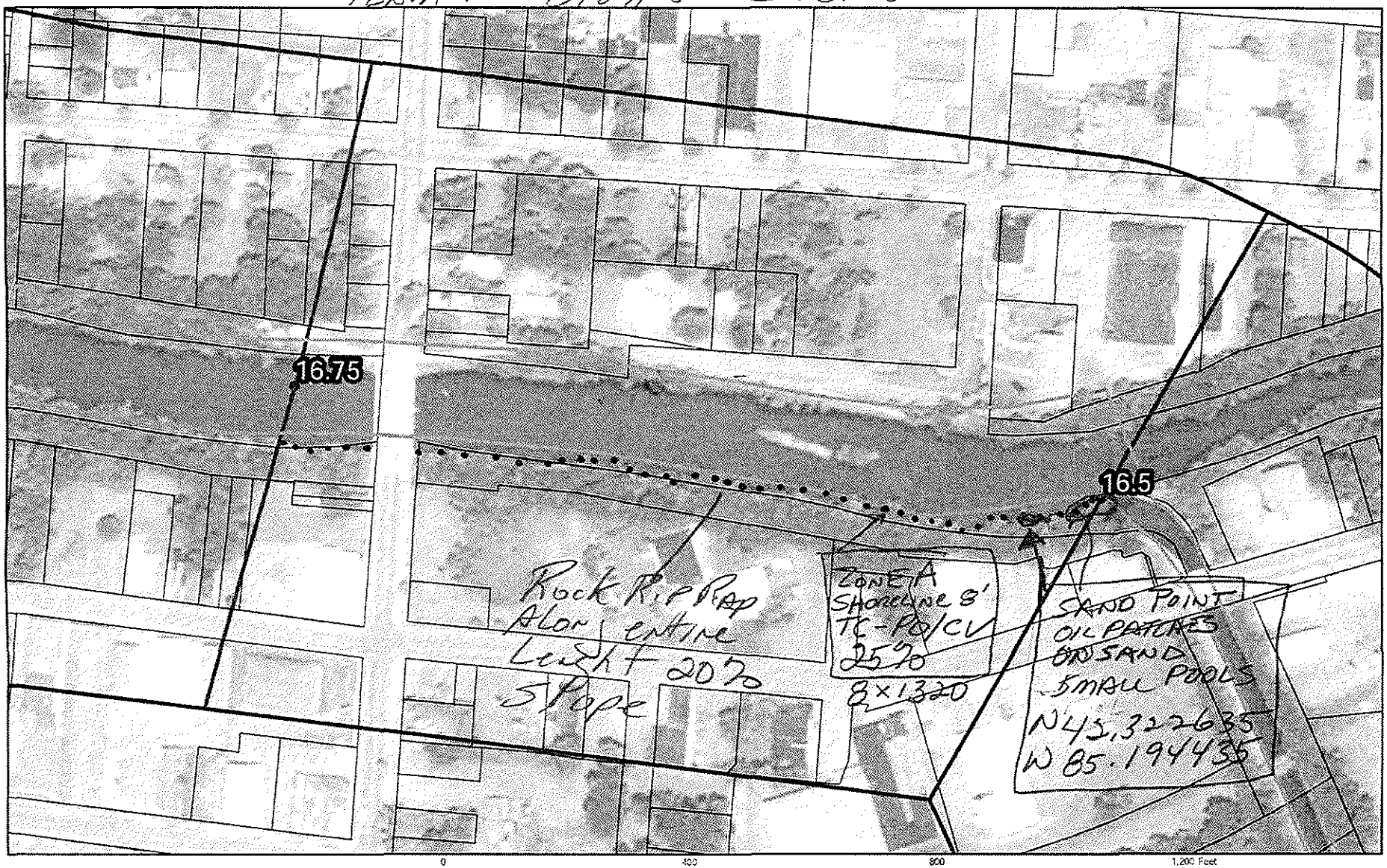
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TEAM 1 8/29/11 S16.75



QuarterMileMarkers
Parcels_100ftBuffer
Shoreline
River_QuarterMiles
Divisions

16.5 to 16.75

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth, Down to Business
www.entrix.com

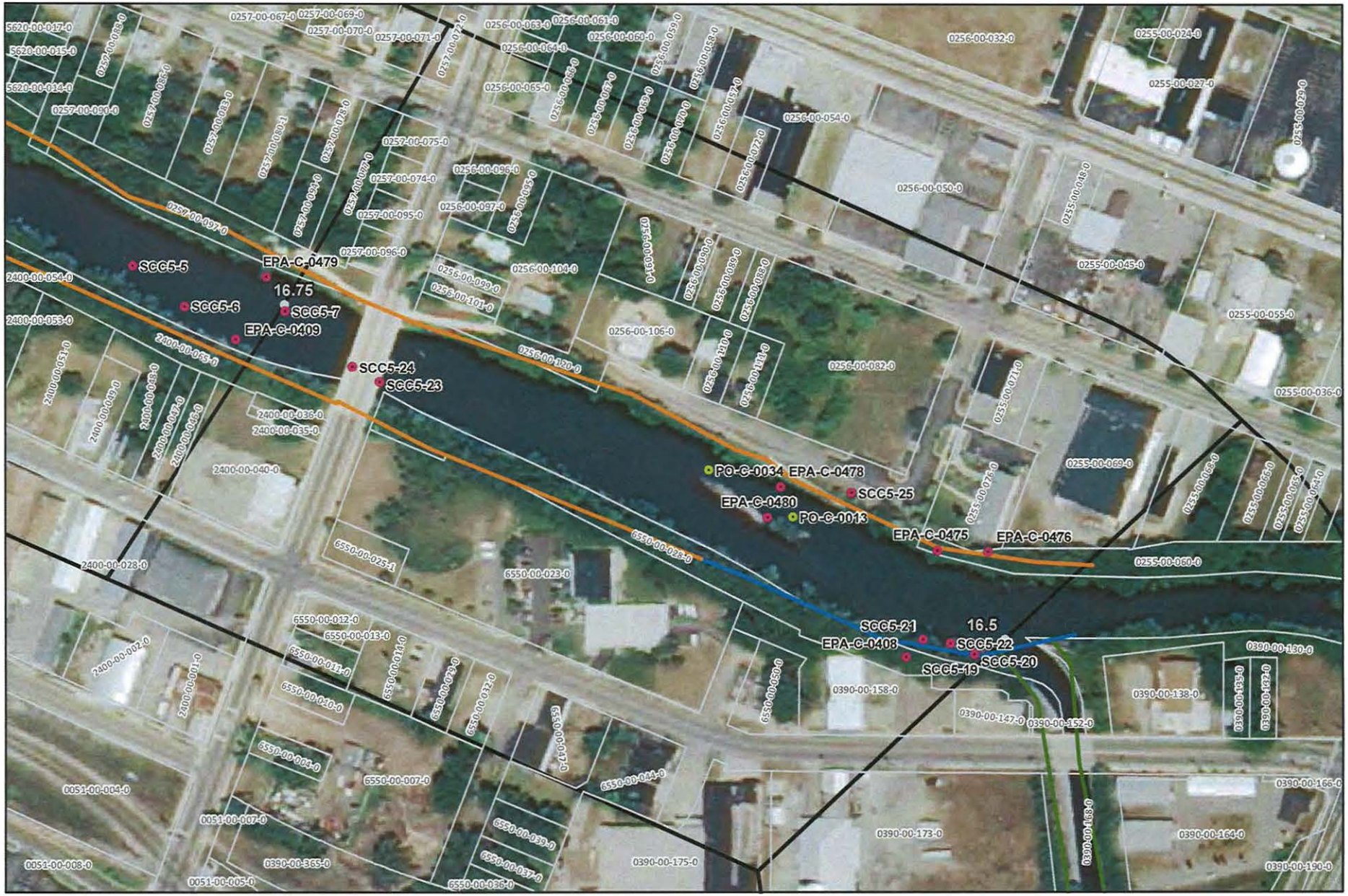
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

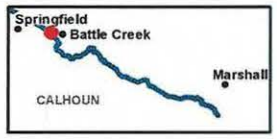
Division C: Mile Marker 16.5 - 16.75 Left Bank while looking downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 16.5-16.75 Island										
SCC5-23	Shoreline	Shoreline Assessment	●		●	●	Island with oiled debris, sand, and vegetation. High volulme flush to boom. In fast current.		42.32387	-85.19768
SCC5-24	Shoreline	Shoreline Assessment	●		●	●	From bridge: oiled riprap boulders and hanging vegetation. High volume wash to collect: cut vegetation.		42.32393	-85.19785
SCC5-25	Shoreline	Shoreline Assessment					Reference point for Ops use: Entry point to do Ops work: concrete path to this point from street.		42.32338	-85.19478





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 16.5-16.75 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

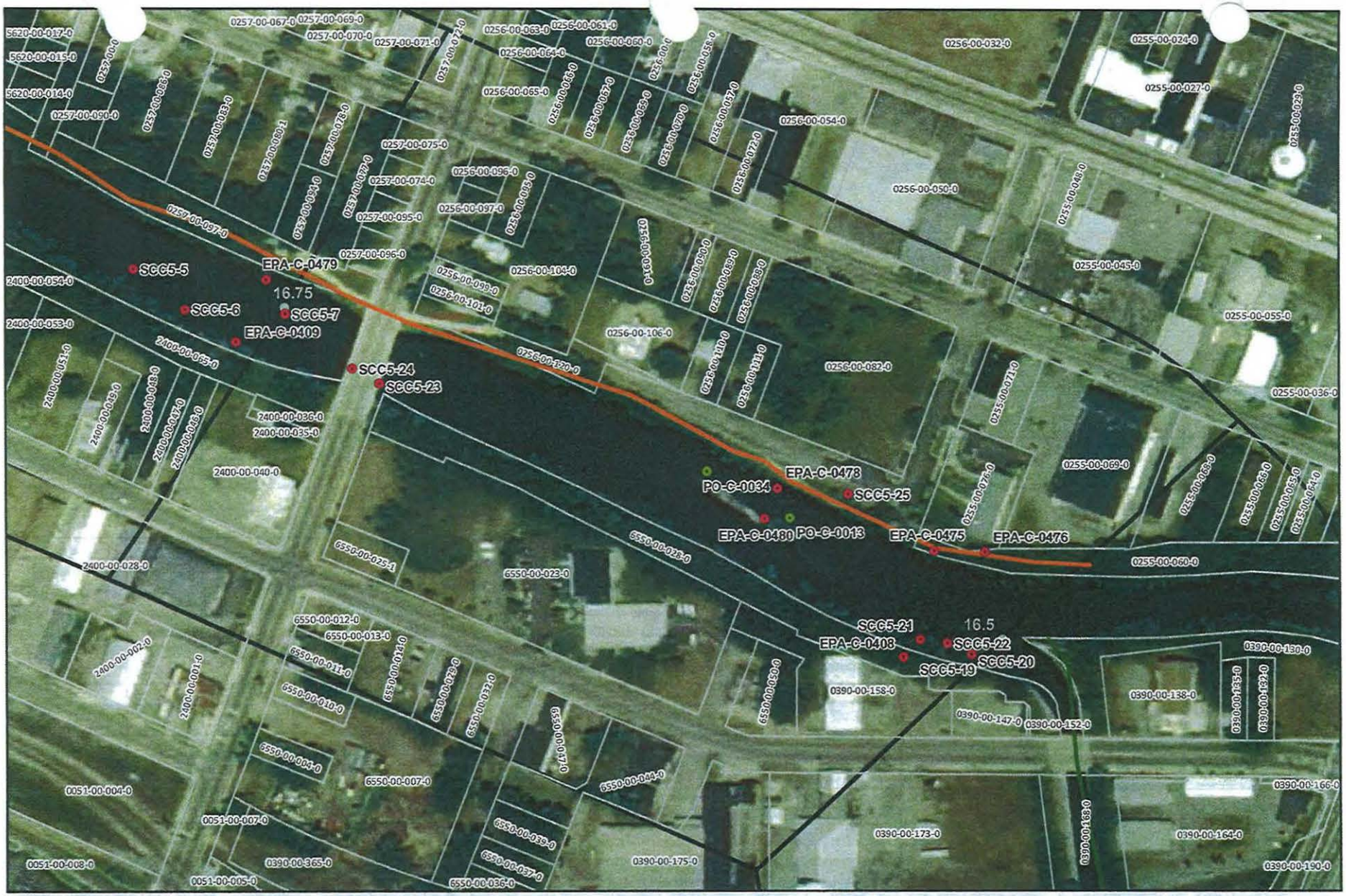
ENTRIX
www.entrix.com

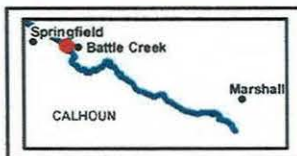
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 16.5-16.75 Right Bank While Looking Downstream										
SCC5-7	Shoreline	Shoreline Assessment					Reference point only.		42.32418	-85.19827
SCC5-19	Shoreline	Shoreline Assessment	•	•	•	•	Oily area below dam. Pooled oil. Swift current in center. Collect with snares or boom.		42.32265	-85.19402
SCC5-22	Shoreline	Shoreline Assessment	•		•	•	Spots of oil hit on riprap and vegetation for 0.2 mile long stretch. High volume flush riprap. Cut veg.		42.32270	-85.19417
EPA-C-0476	Shoreline	SCAT T2 08/29/2010	photo 565					Remove oiled vegetation leaving roots intact up to 10' from waterline.	42.32312	-85.19394
EPA-C-0478	Shoreline	SCAT T2 08/29/2010	GPS taken within zone A; remove oiled debris; cold water high-pressure wash on riprap; cut oiled overhanging veg; photo 566 down stream from MP 16.5; photo 567 is looking upstream from MP 16.75. crew working in area near MP 16.5; hazardous to walk shoreline					Remove oiled vegetation leaving roots intact up to 10' from waterline.	42.32341	-85.19522
EPA-C-0480	Shoreline	SCAT T2 08/29/2010	pooled oil is 5X5 ft on island; sheen coming from island; photo 569 shows island looking upstream; photo 570 shows pooled oil on island					Remove oiled vegetation leaving roots intact up to 10' from waterline. vacuum or use sorbant pads for pooled oil	42.32327	-85.19530





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 16.5-16.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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Coordinate System: NAD 1983 State Plane Michigan South Feet



16.5 to 16.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
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www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 12-Sept-10 Time: AM / PM

Operations Division: C Segment ID: From 165 Start MP to End MP 166.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 86°F

Field Inspection Team

Enbridge Inspector: DOUG DEREN

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

- All points identified by SCAT marked green

N.B. → Oil left by water washing approved by EPA (Bob Foster)

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All points identified by SCAT marked green.

N.B. → Oil left by water washing approved by EPA (Bob Foster)

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-15-10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 16.5 **Start MP to End MP** 16.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

[redacted]

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed the 11 areas of concern from the SCAT report. Clean up required 13 flushing, Pooling, Vegetation + debris removal, high volume flushing, and oiled riprap.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected this segment and all clean up is complete according to the SCAT recommendations.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 16.5-16.75 Left Bank While Looking Downstream											
SCC5-20	Shoreline	Shoreline Assessment	•		•	•	Oiled boulders and water behind bank. Oiled bank & vegetation. Vacuum/high pressure wash & collect. Snare. Note swift current in center (safety).		42.32265	-85.19402	(Y) / N
SCC5-21	Shoreline	Shoreline Assessment	•		•	•	LDB highly oiled sandy shore 10' inland. Bank vegetation coated with oil. Dig up sand and cut veg.		42.32272	-85.19433	(Y) / N
EPA-C-0408	Shoreline	SCAT T1 08/30/2010	Sand BAR at 16.5 has tar covered soil. GPS point at pools of oil. Rocks are coated, woody debris has tar coating. Some overhanging veg. that is oiled. Also surveyed by foot.					Manual removal (scraping or wiping with sorbents on oil < 0.1 cm), high pressure cold water wash, leave unscrapable oil in place, warm water power wash on rocks, rake off soil at sand beach @ 16.5, cut and remove overhanging vegatation, Manually remove pooled tar	42.32264	-85.19444	(Y) / N

Printed Team Members Name: Bill Bates, Pamela Rice, Rachel Matthews
Date: 9/16/10
Comments: SCC5-23 Flag is under the bridge, this is where there was high pressure wash and sorbent boom put in place

EPA-C-0475 SCAT T2 (8/29) Reference point, no confirmation of cleanup recommendation needed

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill											
OPERATIONS CLEANUP RECOMMENDATIONS											
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 16.5-16.75 Island											
SCC5-23	Shoreline	Shoreline Assessment	•		•	•	Island with oiled debris, sand, and vegetation. High volulme flush to boom. In fast current.		42.32387	-85.19768	(Y) / N
SCC5-24	Shoreline	Shoreline Assessment	•		•	•	From bridge: oiled riprap boulders and hanging vegetation. High volume wash to collect: cut vegetation.		42.32393	-85.19785	(Y) / N
SCC5-25	Shoreline	Shoreline Assessment					Reference point for Ops use: Entry point to do Ops work: concrete path to this point from street.		42.32338	-85.19478	(Y) / N

Printed Team Members Name: WILLIAM BATES, Rachel Matthews, Pamela Rice
Date: 9/16/10
Comments:
SCC-5-23, description does not match work that was done or location this point is located on LDB under bridge

SCC5-24 is located on the RDB under the bridge.

PO-0013 (8/18) Pooled oil, remove pooled oil 42.323 -85.195 (Y) / N
PO-0034 (8/19) Pooled oil, remove pooled oil 42.323 -85.196 (Y) / N } flags were not present; no oil observed.

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 16.5-16.75 Island										
SCC5-23	Shoreline	Shoreline Assessment	●		●	●	Island with oiled debris, sand, and vegetation. High volulme flush to boom. In fast current.		42.32387	-85.19768
SCC5-24	Shoreline	Shoreline Assessment	●		●	●	From bridge: oiled riprap boulders and hanging vegetation. High volume wash to collect: cut vegetation.		42.32393	-85.19785
SCC5-25	Shoreline	Shoreline Assessment					Reference point for Ops use: Entry point to do Ops work: concrete path to this point from street.		42.32338	-85.19478

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 16.5-16.75 Right Bank While Looking Downstream											
SCC5-7	Shoreline	Shoreline Assessment					Reference point only.		42.32418	-85.19827	(Y) / N
SCC5-19 LDB	Shoreline	Shoreline Assessment	•	•	•	•	Oily area below dam. Pooled oil. Swift current in center. Collect with snares or boom.		42.32265	-85.19402	(Y) / N
SCC5-22 LDB	Shoreline	Shoreline Assessment	•		•	•	Spots of oil hit on riprap and vegetation for 0.2 mile long stretch. High volume flush riprap. Cut veg.		42.32270	-85.19417	(Y) / N
EPA-C-0476	Shoreline	SCAT T2 08/29/2010	photo 565					Remove oiled vegetation leaving roots intact up to 10' from waterline.	42.32312	-85.19394	(Y) / N
EPA-C-0478	Shoreline	SCAT T2 08/29/2010	GPS taken within zone A; remove oiled debris; cold water high-pressure wash on riprap; cut oiled overhanging veg; photo 566 down stream from MP 16.5; photo 567 is looking upstream from MP 16.75. crew working in area near MP 16.5; hazardous to walk shoreline					Remove oiled vegetation leaving roots intact up to 10' from waterline.	42.32341	-85.19522	(Y) / N
EPA-C-0480	Shoreline	SCAT T2 08/29/2010	pooled oil is 5X5 ft on island; sheen coming from island; photo 569 shows island looking upstream; photo 570 shows pooled oil on island					Remove oiled vegetation leaving roots intact up to 10' from waterline. vacuum or use sorbant pads for pooled oil	42.32327	-85.19530	(Y) / N

Printed Team Members Name: WILLIAM BATES Rachel Matthews, Pamela Rice
Date: 9/16/10
Comments:

SCC5-19 & 22 were staked and flagged on the LDB.

EPA-C-0480 is located on the island

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 16.50 **to MP** 16.75 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Matt Bodson 15-SEP-10 Enbridge
Signature MATT BODSON (date)

Eugene Dennis 9-15-2010 EPA
Signature Eugene Dennis, GPA OSC (date)

4. **SCAT Reassessment**

Pamela E. Rice 9-16-10 Enbridge
Signature Pamela E RICE (date)

9/16/10 EPA
Signature WILLIAM J BATES (date)

9-16-2010 MDNRE
Signature Rachel Matthews (date)

5. **EPA**

9.19.10 EPA Division Supervisor
Signature JASON MUSAWISE (date)

Appendix E
Photographs



Photo 0478 – Looking southeast at left descending bank, near SCC5-23 and SCC5-24.



Photo 0479 – Looking southeast at left descending bank.



Photo 0480 – Looking southeast at left descending bank.



Photo 0481 – Looking east at island, near EPA-C-0480.



Photo 0482 – Looking southeast at left descending bank, near SCC5-19, SCC5-20, SCC5-21 SCC5-22 and EPA-C-0408.

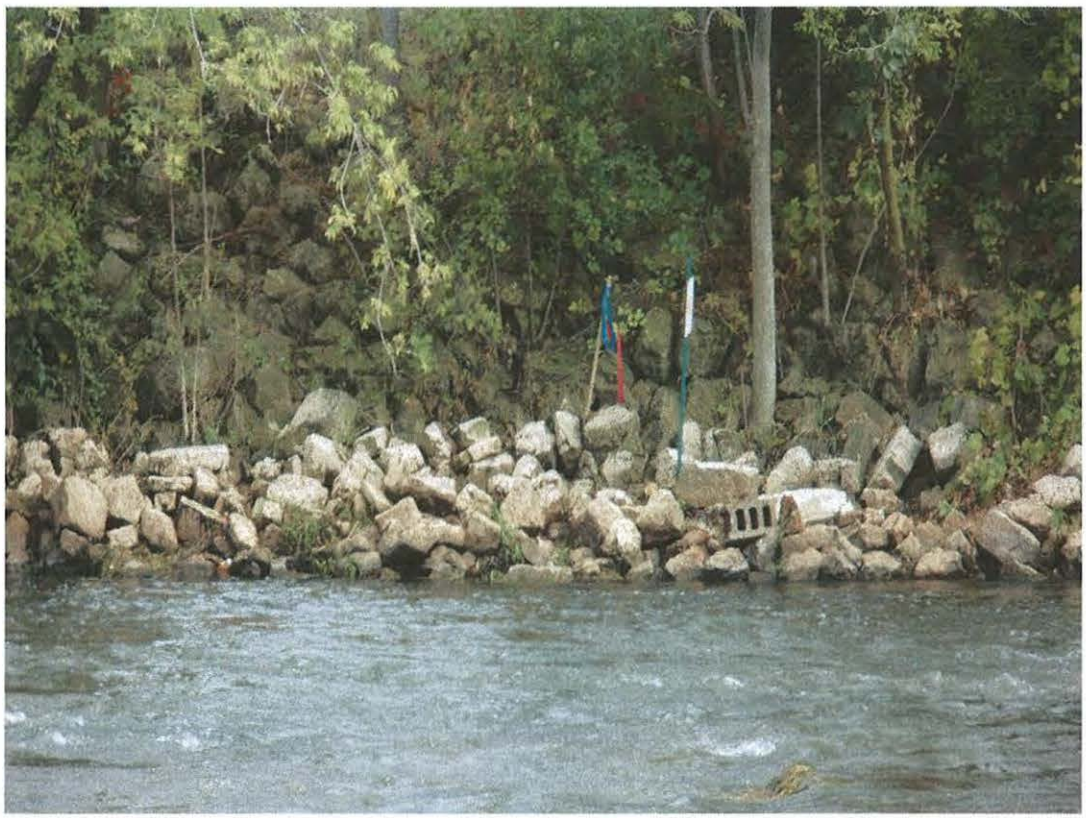


Photo 0483 – Looking north at right descending bank, near EPA-C-0476.



Photo 0484 – Looking west at right descending bank.



Photo 0485 – Looking southeast at right descending bank, near EPA-C-0475.



Photo 0486 – Looking northwest at right descending bank.

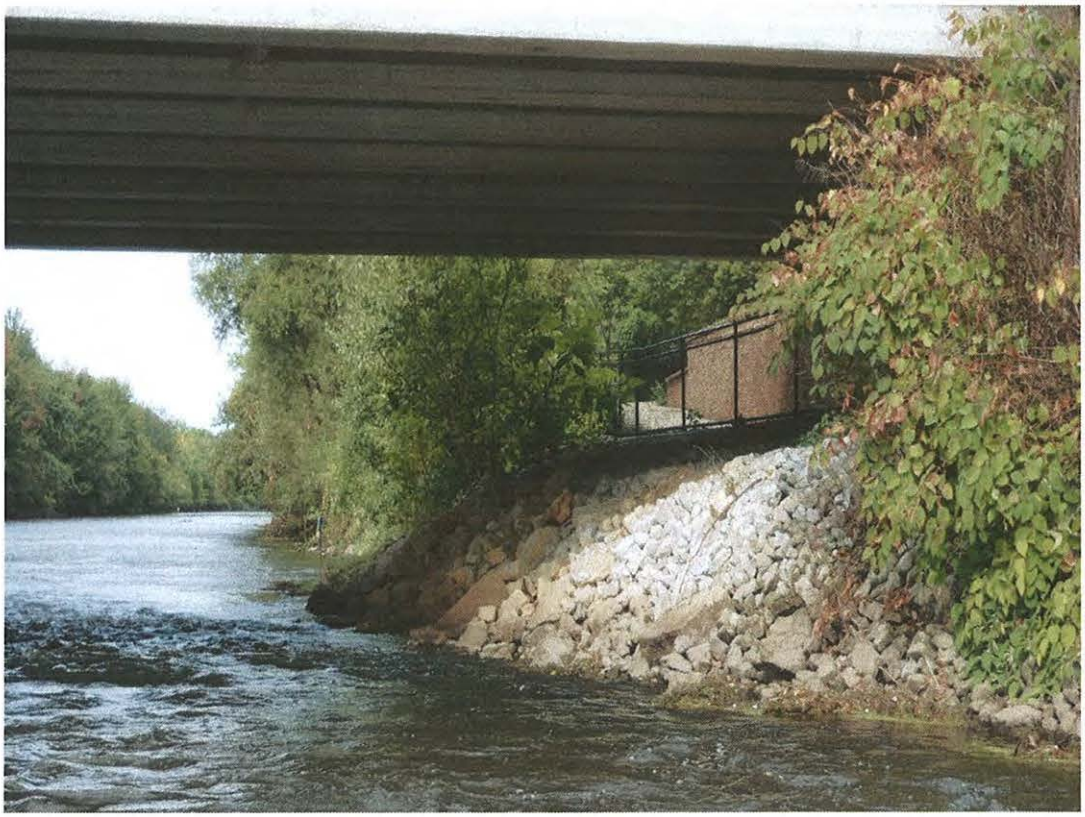


Photo 0487 – Looking northwest at right descending bank, near SCC5-24.



Photo 0488 – Looking northwest at right descending bank, near EPA-C-0479.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 17.00 – MP 16.75 to 17.00

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 17.00 had moderate oiling, oiled vegetation and debris, and oiled rip-rap and boulders on the left descending bank. Islands were absent from the segment. The right descending bank had moderate oiling, pooled oil, and oiled vegetation and debris. The overbank contained no areas requiring clean-up.

Actions

Free oil was recovered from along the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 17.00 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs;
- High volume low pressure flushing for free oil removal with downstream booming, absorbent booms and pads;
- Removal of oiled debris;
- High pressure flushing of man-made structures and/or rocks.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 17.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch maps)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

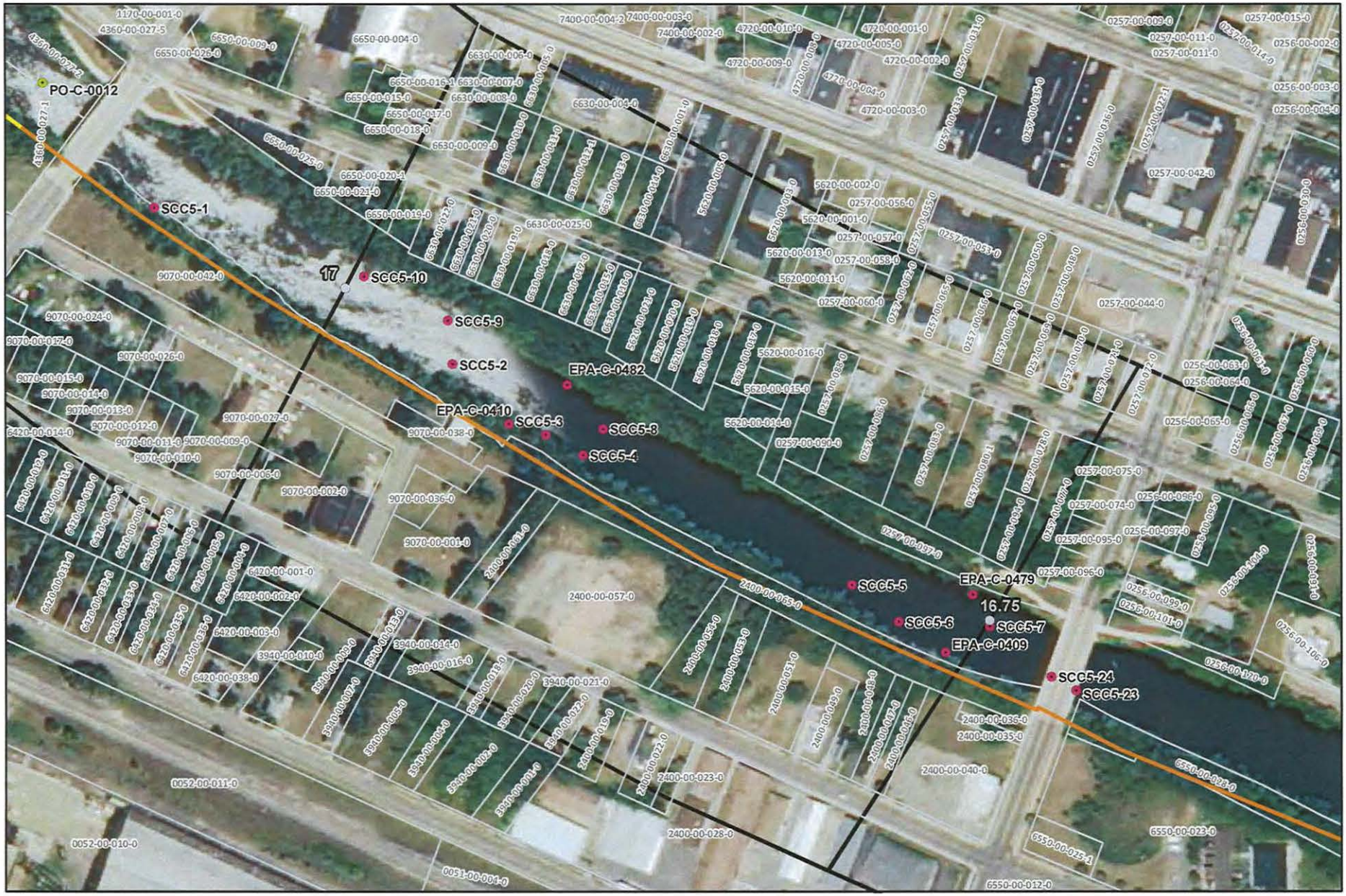
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 16.75-17 Left Bank While Looking Downstream										
SCC5-2	Shoreline	Shoreline Assessment	●		●	●	Oiled vegetation & debris. Cut and remove debris.		42.32547	-85.20190
SCC5-3	Shoreline	Shoreline Assessment	●		●	●	Oiled boulders & logs (10' x 10'). High volume flush. Collect to boom or snare.		42.32512	-85.20127
SCC5-4	Shoreline	Shoreline Assessment	●		●	●	Debris & brush overhanging with oil (steep banks above; cut in areas upstream to bridge).		42.32502	-85.20102
SCC5-5	Shoreline	Shoreline Assessment	●	●	●	●	Debris field with pooled oil at log jam. Cut & flush (high volume). Collect to boom or snare.		42.32438	-85.19920
SCC5-6	Shoreline	Shoreline Assessment	●			●	Remove oily screen as debris (sitting in water).		42.32420	-85.19888
EPA-C-0409	Channel	SCAT T1 08/30/2010	GPS point for end of Zone A. Also surveyed by foot.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.32405	-85.19857
EPA-C-0410	Shoreline	SCAT T1 08/30/2010	Minimal oil along shoreline. Some oiled overhanging vegetation and woody debris. Rip rap shoreline; very little oil on rocks. Most oil on woody vegetation. GPS point taken at end of zone.					Leave oil in place	42.32517	-85.20152





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 16.75-17
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

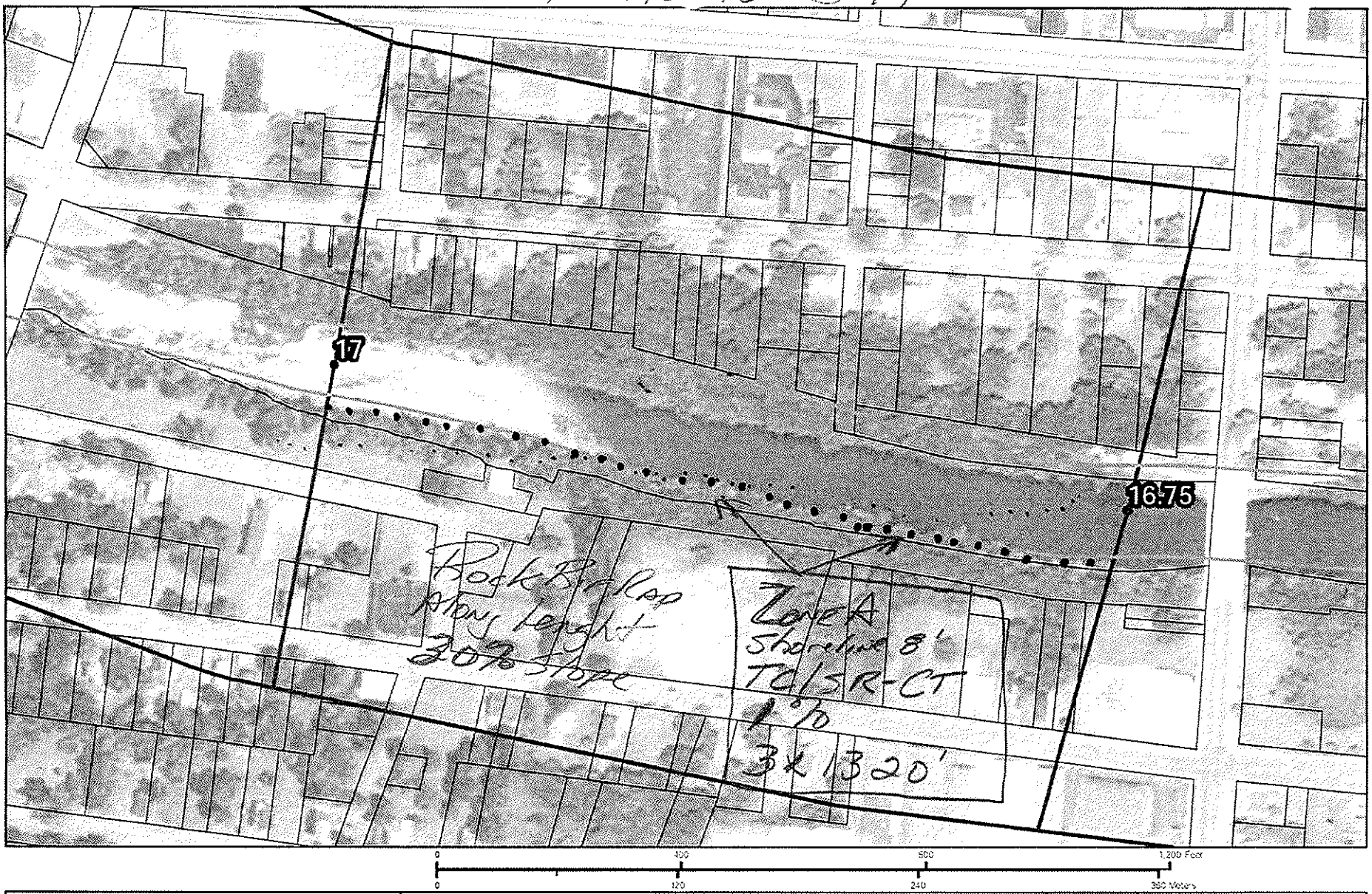
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TCAM 1 8/6/10 S17



QuarterMileMarkers
Parcels_102009Buffer
Shoreline
River_QuarterMiles
Divisions

16.75 to 17.0

Division C: Mile Marker 16.75 - 17 Left Bank while looking downstream

ENTRIX
Down to Earth. Down to Business

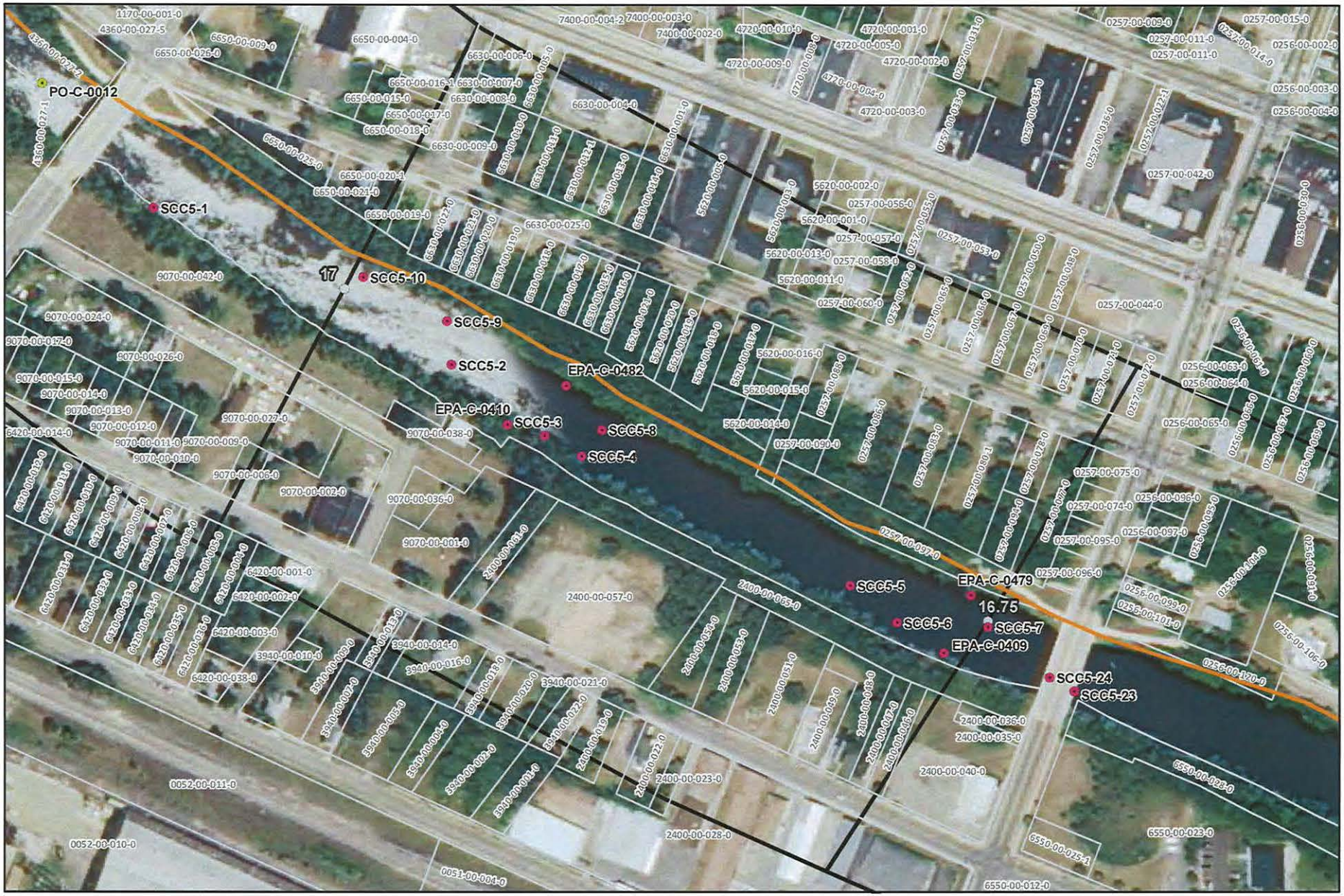
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 16.75-17 Right Bank While Looking Downstream										
SCC5-8	Shoreline	Shoreline Assessment	●	●	●	●	Coated three stumps and log jam. Also pooled oil. Further review of floodplain behind. Cut and wash.		42.32515	-85.20088
SCC5-9	Shoreline	Shoreline Assessment	●	●	●	●	Overhanging vegetation & debris coated. Also pooled oil. Flush to boom (or vacuum), and snare & collect.		42.32568	-85.20193
SCC5-10	Shoreline	Shoreline Assessment			●	●	Tree overhanging and wood. Cut and remove debris.		42.32590	-85.20250
EPA-C-0479	Channel	SCAT T2 08/29/2010	GPS at MP 16.75 and end of zone A. crew working in area near MP 16.5; hazardous to walk shoreline					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.32434	-85.19838
EPA-C-0482	Shoreline	SCAT T2 08/29/2010	photo 568 is looking downstream from milepost 16.75 remove oiled debris, cut oiled overhanging veg; stirred up sheen from sediment as walking shoreline; manual removal of tar balls on sediment with flat shovel; mousse piling up where slow current and debris present; photo 572 shows sheen on water; GPS taken near tar balls on sediment (see photo 573); photo 571 is looking upstream from MP 17.0					Cut and bag low hanging limbs extending over and into the water 2in above oiling level. Remove oiled vegetation leaving roots intact up to 10' from waterline, do not remove oiled woody plants >2", no scraping, leave oiled soil	42.32537	-85.20113





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 16.75-17
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

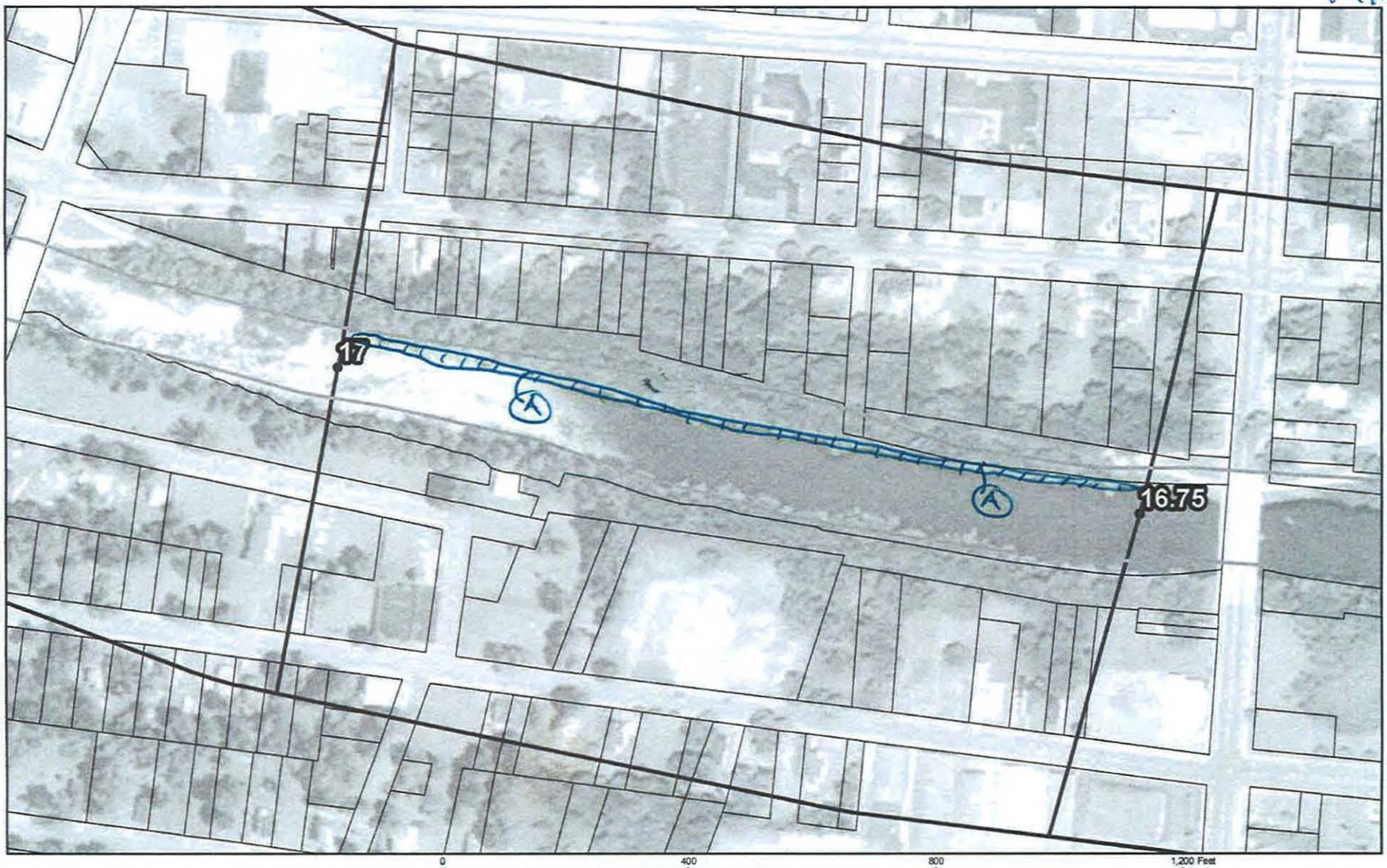
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TEAM 1 12/10



QuartermileMarkers
Parcels_1000ftBuffer
Shoreline
River_QuarterMiles
Divisions

16.75 to 17.0

Division C: Mile Marker 16.75 - 17 Right Bank while looking downstream

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth, Down to Business
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 14-Sept-10 Time: AM / PM

Operations Division: C Segment ID: From 16.75 Start MP to End MP 17.0 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 76° F

Field Inspection Team

Enbridge Inspector: Dave Dorken

Division Supervisor(Contractor): Steve Turner

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All points identified by SCAT marked green

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All points identified by SCAT marked green.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-15-10 **Time: AM / PM**

Operations Division: 3 C **Segment ID: From** 16.75 **Start MP to End MP** 17.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

[redacted]

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 12 areas of concern from the SCAT report. Clean up required is flushing, Pooling, Veg debris removed, overhanging veg., and hot Power washing the riprap.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected this area and all clean up is complete according to the SCAT recommendations.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill											
OPERATIONS CLEANUP RECOMMENDATIONS											
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 16.75-17 Left Bank While Looking Downstream											
SCC5-2	Shoreline	Shoreline Assessment	●		●	●	Oiled vegetation & debris. Cut and remove debris.		42.32547	-85.20190	Y / N
SCC5-3	Shoreline	Shoreline Assessment	●		●	●	Oiled boulders & logs (10' x 10'). High volume flush. Collect to boom or snare.		42.32512	-85.20127	Y / N
SCC5-4	Shoreline	Shoreline Assessment	●		●	●	Debris & brush overhanging with oil (steep banks above; cut in areas upstream to bridge).		42.32502	-85.20102	Y / N
SCC5-5	Shoreline	Shoreline Assessment	●	●	●	●	Debris field with pooled oil at log jam. Cut & flush (high volume). Collect to boom or snare.		42.32438	-85.19920	Y / N
SCC5-6	Shoreline	Shoreline Assessment	●			●	Remove oily screen as debris (sitting in water).		42.32420	-85.19888	Y / N
EPA-C-0409	Channel	SCAT T1 08/30/2010	GPS point for end of Zone A. Also surveyed by foot.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.32405	-85.19857	Y / N
EPA-C-0410	Shoreline	SCAT T1 08/30/2010	Minimal oil along shoreline. Some oiled overhanging vegetation and woody debris. Rip rap shoreline; very little oil on rocks. Most oil on woody vegetation. GPS point taken at end of zone.					Leave oil in place	42.32517	-85.20152	Y / N

this was not flagged in the field

Bill Bates, Rachel Matthews, Pamela Rice

9/16/10

Zone A references the entire left bank

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 16.75-17 Right Bank While Looking Downstream											
SCC5-8	Shoreline	Shoreline Assessment	●	●	●	●	Coated three stumps and log jam. Also pooled oil. Further review of floodplain behind. Cut and wash.		42.32515	-85.20088	(Y) / N
SCC5-9	Shoreline	Shoreline Assessment	●	●	●	●	Overhanging vegetation & debris coated. Also pooled oil. Flush to boom (or vacuum), and snare & collect.		42.32568	-85.20193	(Y) / N
SCC5-10	Shoreline	Shoreline Assessment			●	●	Tree overhanging and wood. Cut and remove debris.		42.32590	-85.20250	(Y) / N
EPA-C-0479	Channel	SCAT T2 08/29/2010	GPS at MP 16.75 and end of zone A. crew working in area near MP 16.5; hazardous to walk shoreline					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.32434	-85.19838	(Y) N
EPA-C-0482	Shoreline	SCAT T2 08/29/2010	photo 568 is looking downstream from milepost 16.75 remove oiled debris, cut oiled overhanging veg; stirred up sheen from sediment as walking shoreline; manual removal of tar balls on sediment with flat shovel; mousse piling up where slow current and debris present; photo 572 shows sheen on water; GPS taken near tar balls on sediment (see photo 573); photo 571 is looking upstream from MP 17.0					Cut and bag low hanging limbs extending over and into the water 2in above oiling level. Remove oiled vegetation leaving roots intact up to 10' from waterline, do not remove oiled woody plants >2", no scraping, leave oiled soil	42.32537	-85.20113	(Y) / N

Printed Team Members Name: WILLIAM BATES, Rachel Mathews, Pamela Rice
Date: 9/16/10
Comments:

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 16.75 **to MP** 17.0 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Mark Bradson 15-Sep-10 Enbridge
Signature MARK BRADSON (date)

Eugene Dennis 9-15-2010 EPA
Signature Eugene Dennis, EPA OSC (date)

4. **SCAT Reassessment**

Pamela E. Rice 9-16-10 Enbridge
Signature Pamela E. Rice (date)

9/16/10 EPA
Signature WILLIAM J BATES (date)

9-16-2010 MDNRE
Signature Rachel Matthews (date)

5. **EPA**

JASON MUSANTE 9.19.10 EPA Division Supervisor
Signature JASON MUSANTE (date)

Appendix E
Photographs



Photo 0472 – Looking southeast at left descending bank, near SCC5-2, SCC5-3 and SCC5-4.



Photo 0473 – Looking southeast at left descending bank.



Photo 0474 – Looking southeast at left descending bank.



Photo 0475 – Looking southeast at left descending bank, near SCC5-5.



Photo 0476 – Looking south at left descending bank.



Photo 0477 – Looking south at left descending bank, near EPA-C-0409.



Photo 0489 – Looking northwest at right descending bank.



Photo 0490 – Looking northwest at right descending bank.



Photo 0491 – Looking north at right descending bank, near SCC5-8.



Photo 0492 – Looking northwest at right descending bank, near EPA-C-0482.



Photo 0493 – Looking north at right descending bank, near SCC5-9.



Photo 0494 – Looking northeast at right descending bank, near SCC5-10.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 17.25 – MP 17.00 to 17.25

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 17.25 had light to moderate oiling, oiled vegetation, and oiled rip-rap on the left descending bank. An island was present with oiled vegetation and pooled oil observed. The right descending bank had light to moderate oiling. The overbank contained no areas requiring clean-up.

Actions

Free oil was recovered from along the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 17.25 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs;
- High volume low pressure flushing for free oil removal with downstream booming, absorbent booms and pads.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled rocks and cobble;
- Oiled herbaceous vegetation;
- Oiled manmade structures.

Segment 17.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch maps)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

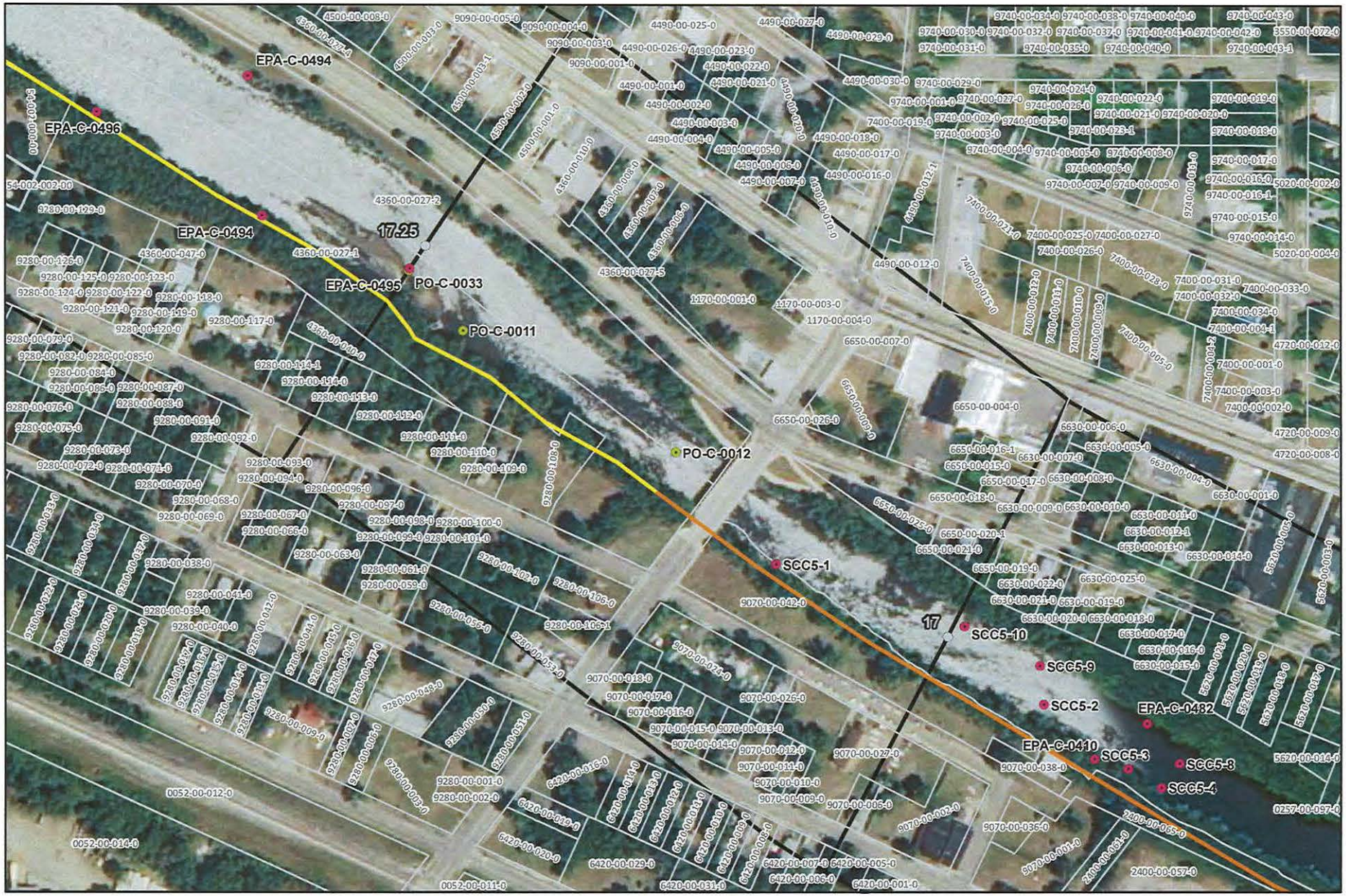
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 17-17.25 Left Bank While Looking Downstream										
SCC5-1	Shoreline	Shoreline Assessment	•				1/4 mile length filmed oil along semi-bouldered shoreline. High volume flush boulders & other substrate.		42.32623	-85.20392
EPA-C-0495	Shoreline	SCAT T4 08/29/2010	Island has coated/covered vegetation and 2 small pools (~2ft x1ft). Photo 3 is island.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.32785	-85.20667
EPA-C-0494	Shoreline	SCAT T4 08/29/2010	Rocks under bridge were covered/coated. Shoreline was not consistently covered, only spotty areas were impacted. Photo 4 is at 17.25 looking upstream (end of zone).					3/4 of zone was concrete rip rap. Patchy sections of overhanging vegetation was stained/oiled. Should be removed. Rip Rap can be pressure washed where needed.	42.32814	-85.20778





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 17-17.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

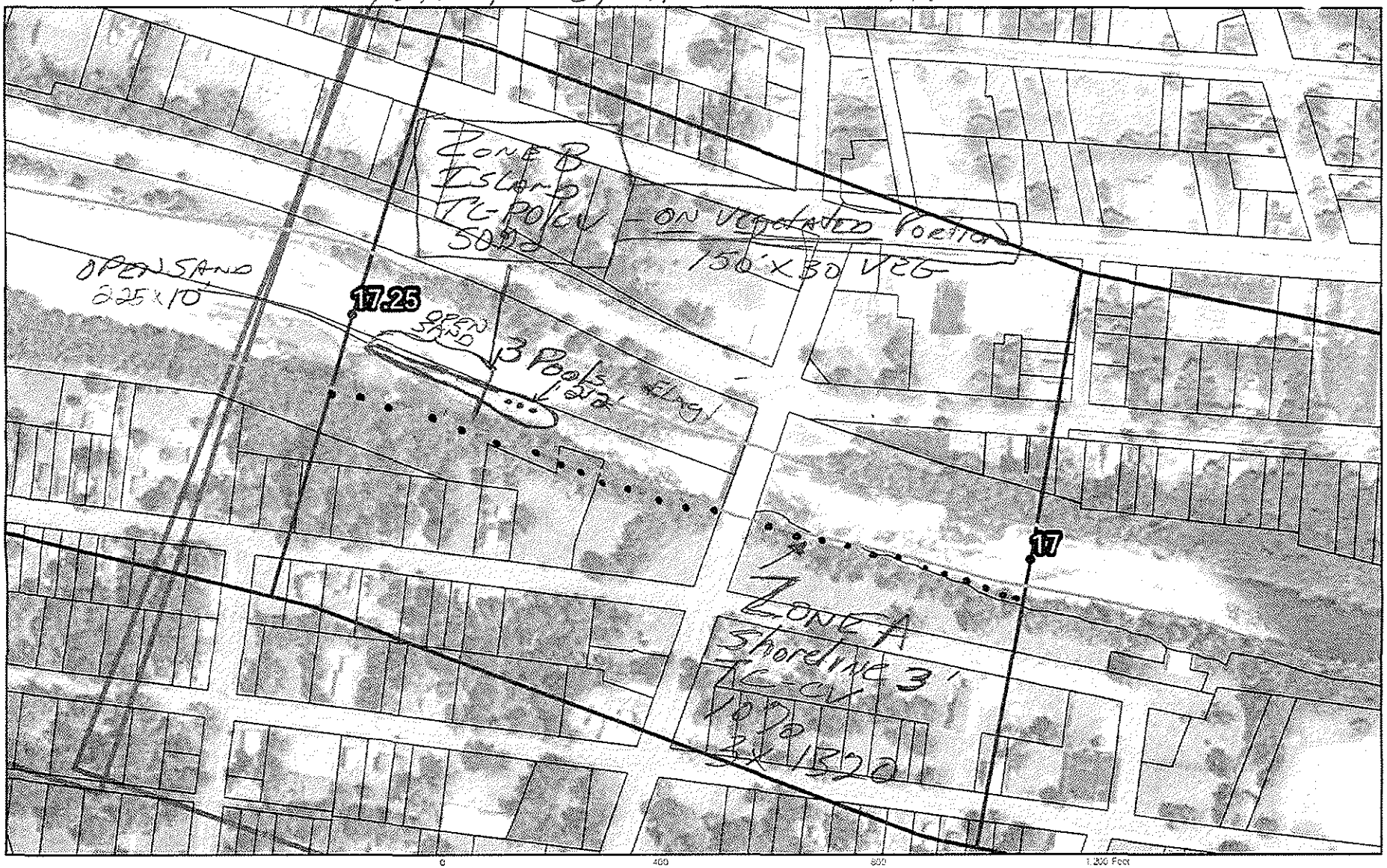
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TEAM 1 8/29/ > 517.25



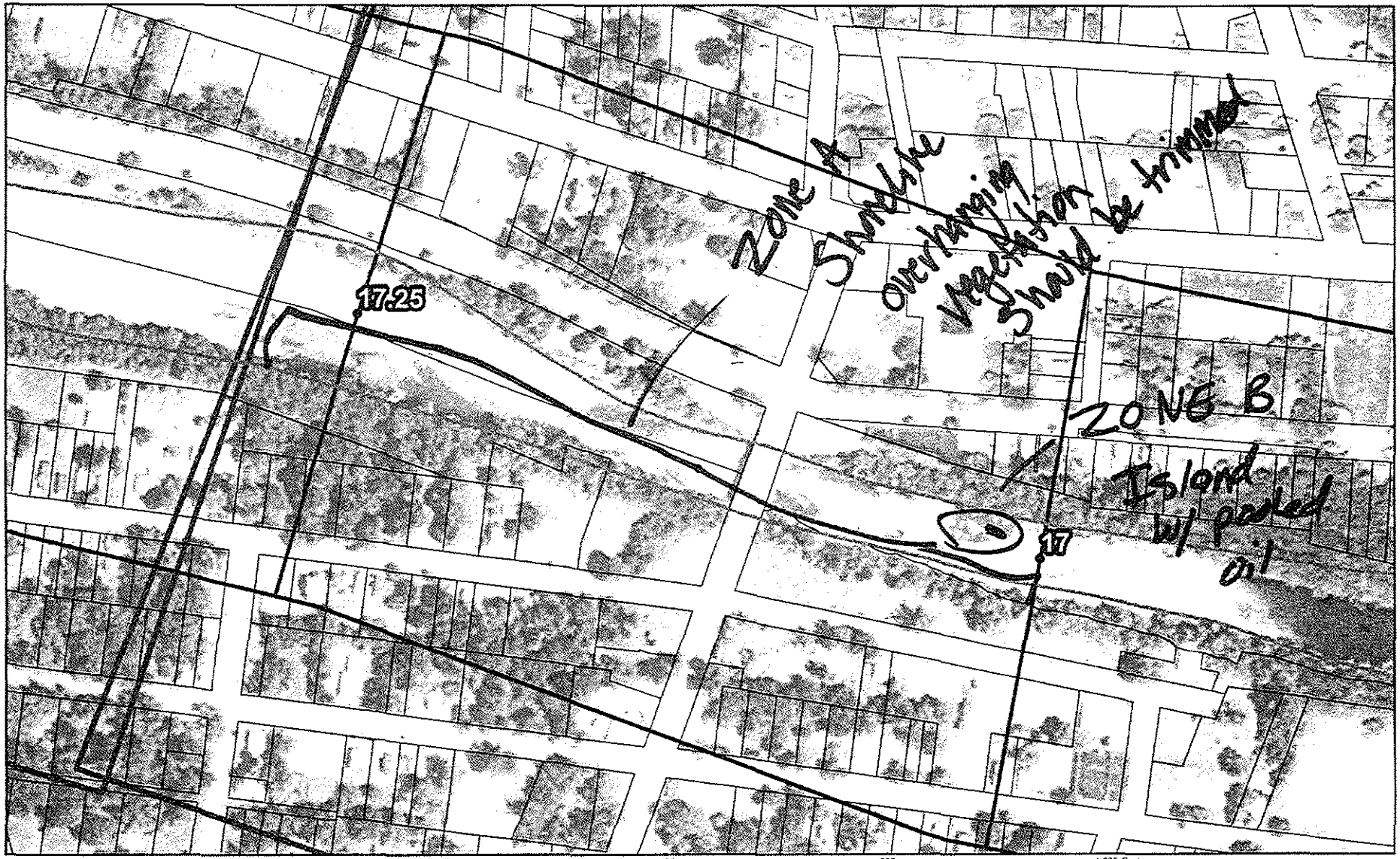
WP 98 N 42.32813
W 85.20766

17.0 to 17.25

Division C: Mile Marker 17 - 17.25 Left Bank while looking downstream

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

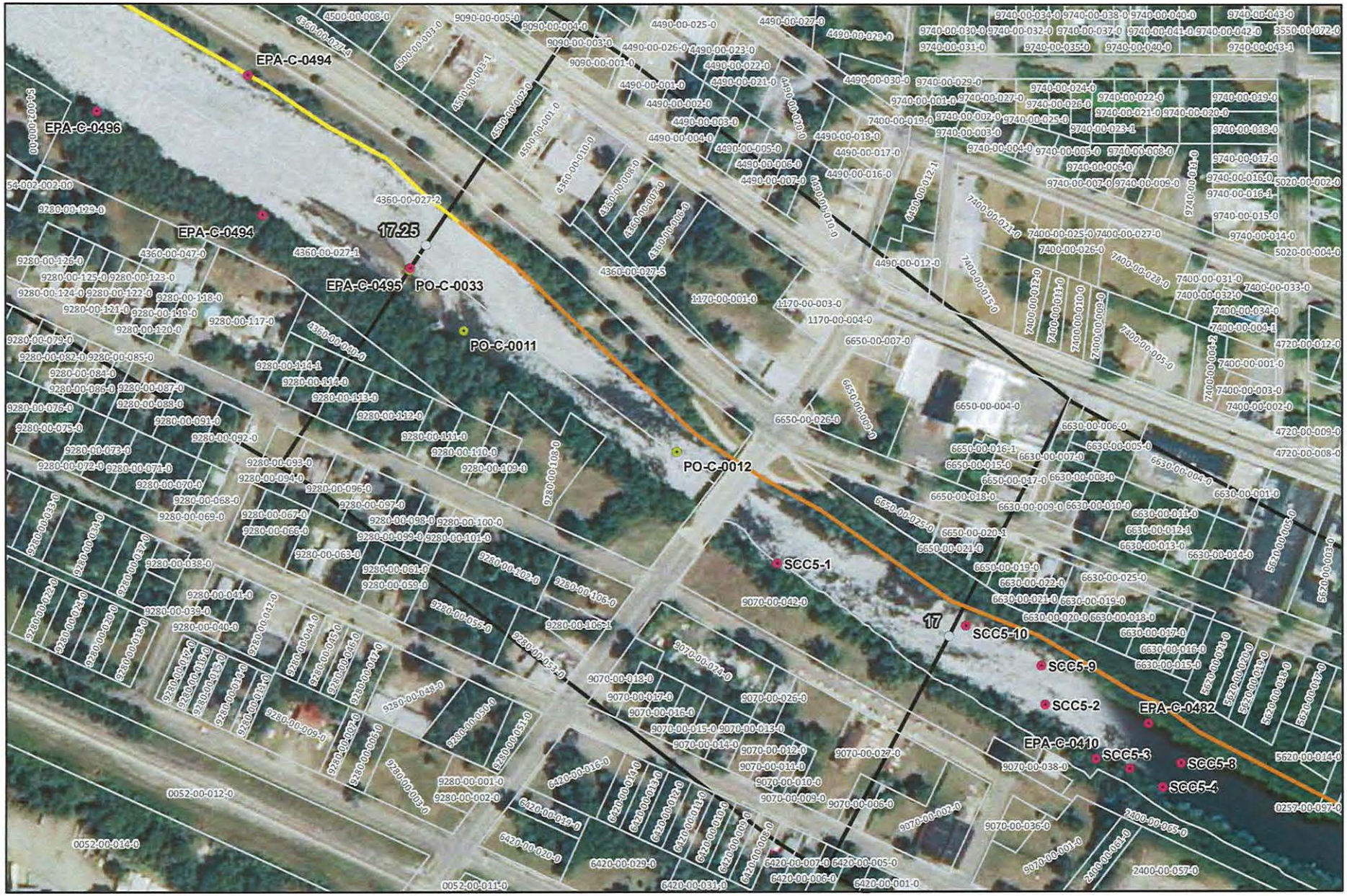


Division C: Mile Marker 17 - 17.25 Left Bank while looking downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 17-17.25 Right Bank While Looking Downstream										
No Operational Focus Areas identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

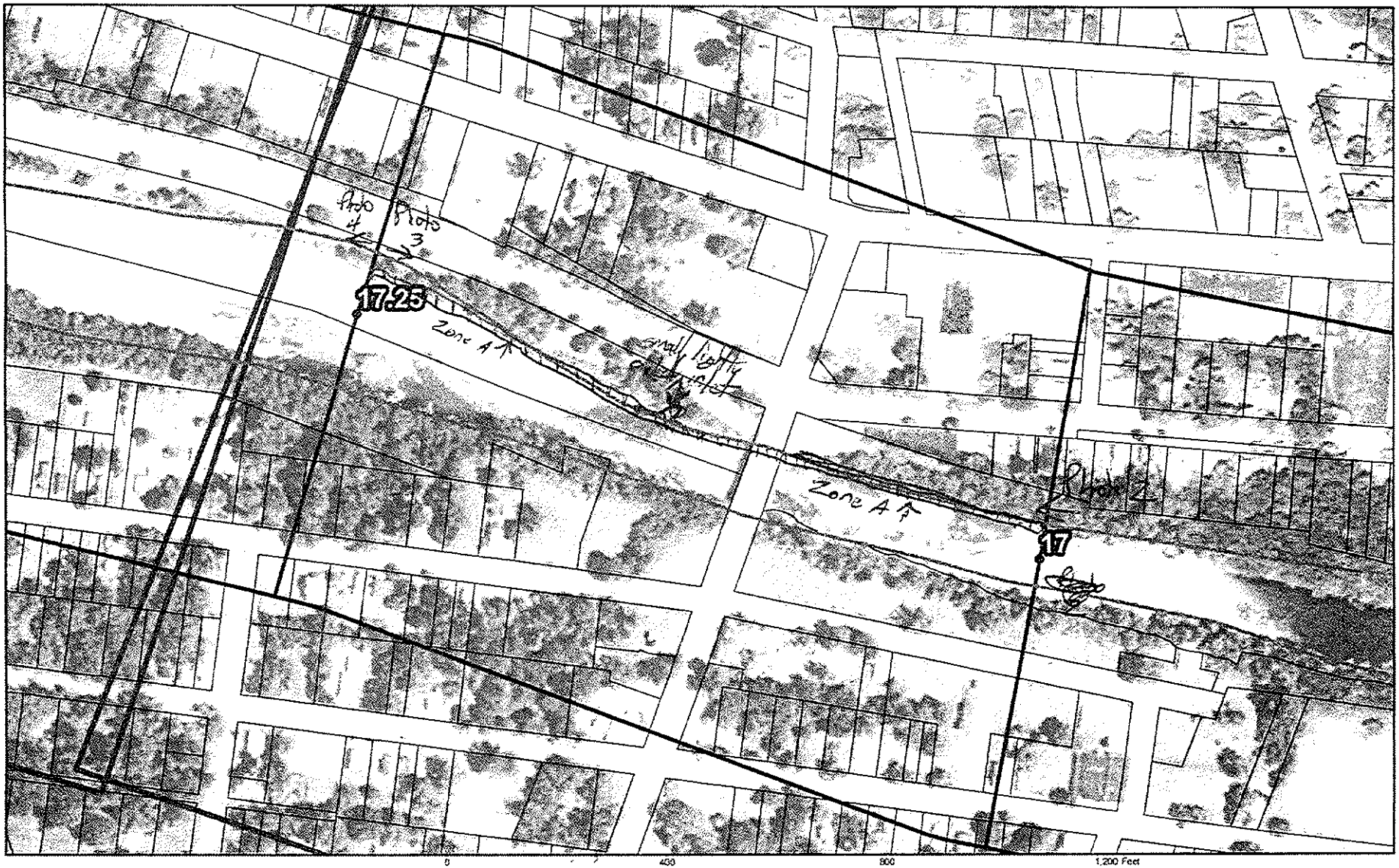
Division C: Mile Marker 17-17.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



QuarterMileMarkers
Parcels_102001Buffer
Shoreline
River_QuarterMiles
Divisions

Team #3
8/29/2010

17.0 to 17.25

Division C: Mile Marker 17 - 17.25 Right Bank while looking downstream

Image 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth, Down to Business

www.entrix.com

Coordinate System NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 12-Sept-10 Time: AM / PM

Operations Division: C Segment ID: From 17.0 Start MP to End MP 17.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 76 °F

Field Inspection Team [signature] Doug Deren

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature] Steve Turner

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

- All points identified by SCAT marked green

NB → Oil left by water washing approved by EPA (Bob Foster)

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All points identified by SCAT marked green.

NB → Oil left by water washing approved by EPA (Bob Foster).

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Revised9/01/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-13-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 17.0 **Start MP to End MP** 17.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

[redacted]

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

After reviewing the SCAT report the RDB required no action. LDB required flushing along shoreline, and the Island had pooled oil along with vegetation removal.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected this segment and all clean up is complete according to the SCAT recommendations.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

[signature]

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 17-17.25 Left Bank While Looking Downstream											
SCC5-1	Shoreline	Shoreline Assessment	•				1/4 mile length filmed oil along semi-bouldered shoreline. High volume flush boulders & other substrate.		42.32623	-85.20392	(Y) / N
EPA-C-0495	Shoreline	SCAT T4 08/29/2010	Island has coated/covered vegetation and 2 small pools (~2ft x1ft). Photo 3 is island.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.32785	-85.20667	(Y) / N
EPA-C-0494	Shoreline	SCAT T4 08/29/2010	Rocks under bridge were covered/coated. Shoreline was not consistently covered, only spotty areas were impacted. Photo 4 is at 17.25 looking upstream (end of zone).					3/4 of zone was concrete rip rap. Patchy sections of overhanging vegetation was stained/oiled. Should be removed. Rip Rap can be pressure washed where needed.	42.32814	-85.20778	(Y) / N

Printed Team Members Name: Pamela Rice, Rachel Matthews, Bill Pates
Date: 9/16/10
Comments:

EPA-C-0495 is located on the island.

EPA-C-0494 is located on the next segment on the aerial map and has its name changed to 0530 but should be assessed in this current segment
EPA-C-495 has changed to 0531 and is on this current recommendation table
PO-0011 (8/18) Pooled oil, pooled oil should be removed 42.328 -85.206 (Y) / N
PO-0012 (8/18) Pooled oil, pooled oil should be removed 42.327 -85.205 (Y) / N
PO-0033 (8/19) Pooled oil, pooled oil should be removed 42.328 -85.207 (Y) N

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 17-17.25 Right Bank While Looking Downstream										
No Operational Focus Areas identified.										

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From** 17.0 **Start MP to End MP** 17.25 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☐

3. **Inspection**

Signature (date) Enbridge — See separate Form

Signature (date) EPA

Segment sign off occurred after Step 3 sign-off

4. **SCAT Reassessment**

Pamela E. Rice 9/16/10 Signature (date) Enbridge
PAMELA E. RICE

9/16/10 Signature WILLIAM J BATES (date) EPA

9-16-2010 Signature Rachel Matthews (date) MDNRE

5. **EPA**

Jason Mumaw 9.19.10 Signature (date) EPA Division Supervisor
JASON MUMAW

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 17.0 **to MP** 17.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Matt Gordon 16-Sep-10 Enbridge
Signature (date)

Eugene Downs 9-16-2010 EPA
Signature (date)
Eugene Downs EPA OSC

4. **SCAT Reassessment**

_____ Enbridge
Signature (date)

_____ EPA
Signature (date)

_____ MDNRE
Signature (date)

5. **EPA**

_____ EPA Division Supervisor
Signature (date)

Appendix E
Photographs



Photo 0459 – Looking southwest at left descending bank, near EPA-C-0530.



Photo 0461 – Looking southeast at left descending bank.



Photo 0463 – Looking southeast at island, near EPA-C-0495.



Photo 0464 – Looking southeast at left descending bank.



Photo 0465 – Looking southeast at left descending bank.



Photo 0466 – Looking southwest at left descending bank.



Photo 0467 – Looking south at left descending bank, near EPA-C-0494.



Photo 0468 – Looking southeast at left descending bank.



Photo 0469 – Looking south at left descending bank, near SCC5-1.



Photo 0470 – Looking southeast at left descending bank.



Photo 0495 – Looking northwest at right descending bank.



Photo 0496 – Looking northwest at right descending bank.



Photo 0497 – Looking north at right descending bank.



Photo 0498 – Looking northeast at right descending bank.



Photo 0499 – Looking northwest at right descending bank.

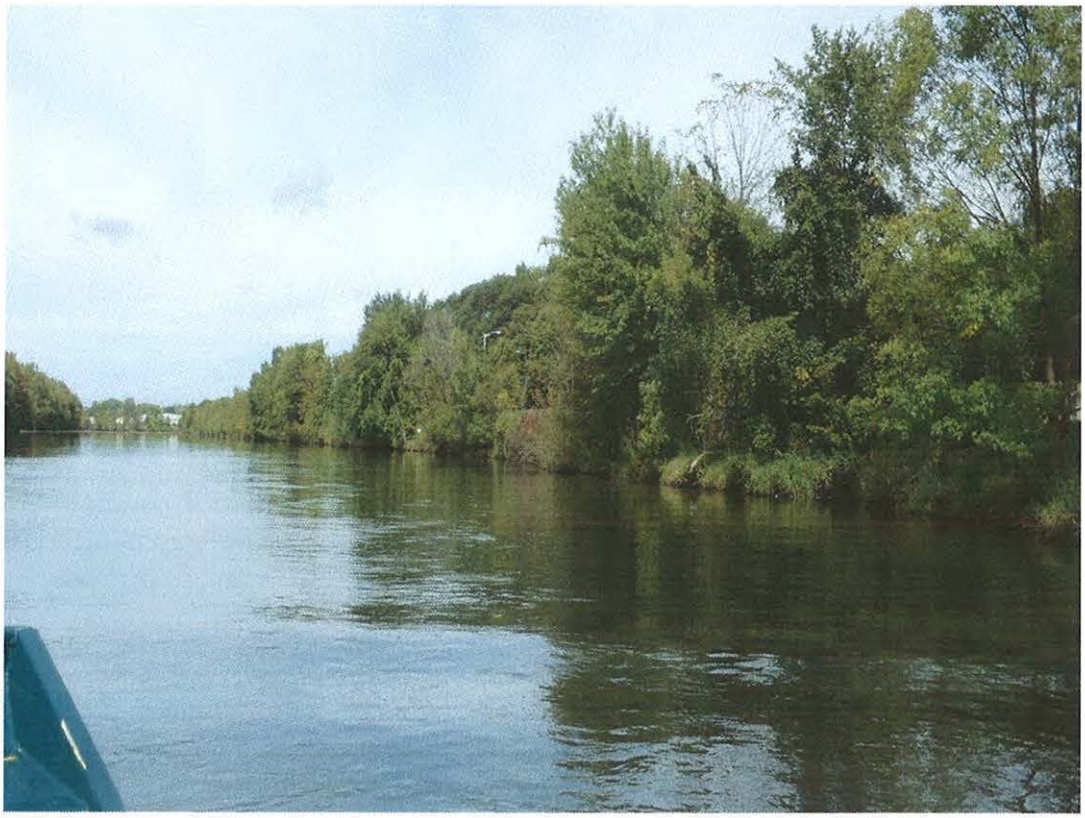


Photo 0500 – Looking northwest at right descending bank, near EPA-C-0531.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 17.50 – MP 17.25 to 17.50

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 17.50 had light oiling on the left and right descending banks. Oiling was also observed on rocks of the left descending bank under the bridge. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 17.50 consisted of the following:

- Woody vegetation less than 2" in diameter removed
- Removal of oiled vegetation leaving roots intact up to 10' from waterline
- Removal of oiled debris
- High pressure flushing of man-made structures and/or rocks

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 17.50 has reached the operational end points for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

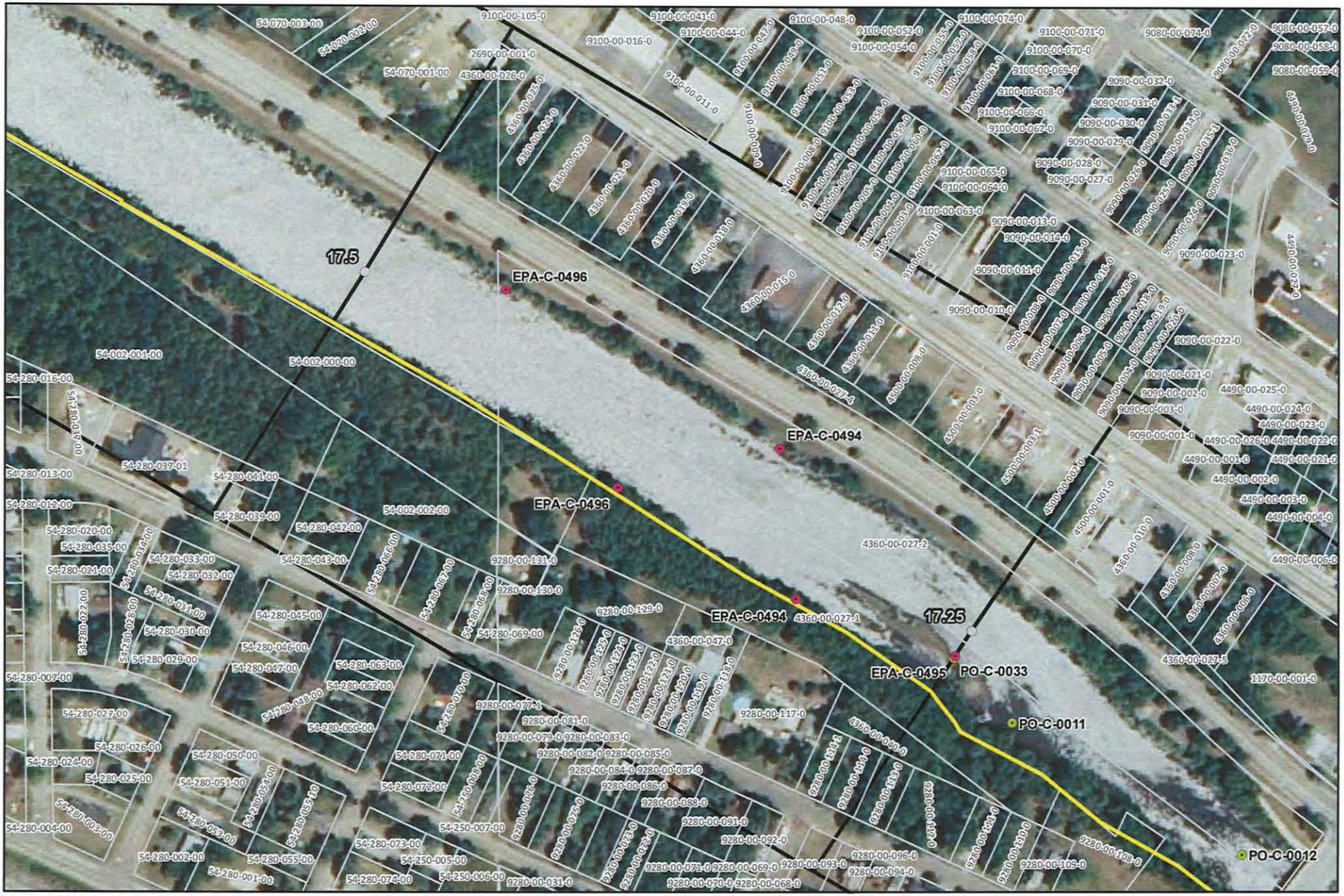
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 17.25-17.5 Left Bank While Looking Downstream										
EPA-C-0494	Shoreline	SCAT T4 08/29/2010	Rocks under bridge were covered/coated. Shoreline was not consistently covered, only spotty areas were impacted. Photo 4 is at 17.25 looking upstream (end of zone).					3/4 of zone was concrete rip rap. Patchy sections of overhanging vegetation was stained/oiled. Should be removed. Rip Rap can be pressure washed where needed.	42.32814	-85.20778
EPA-C-0496	Shoreline	SCAT T4 08/29/2010	Photo 5 is at MP 17.25 looking downstream. Photo 6 looking upstream at MP 17.5. minimal staining of fine roots - no Further cleanup recomendation. Overhanging vegetation and debris has been removed. AREA is CLEAR					Sheen on water in river	42.32870	-85.20902





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 17.25-17.5
Left Bank While Looking Downstream

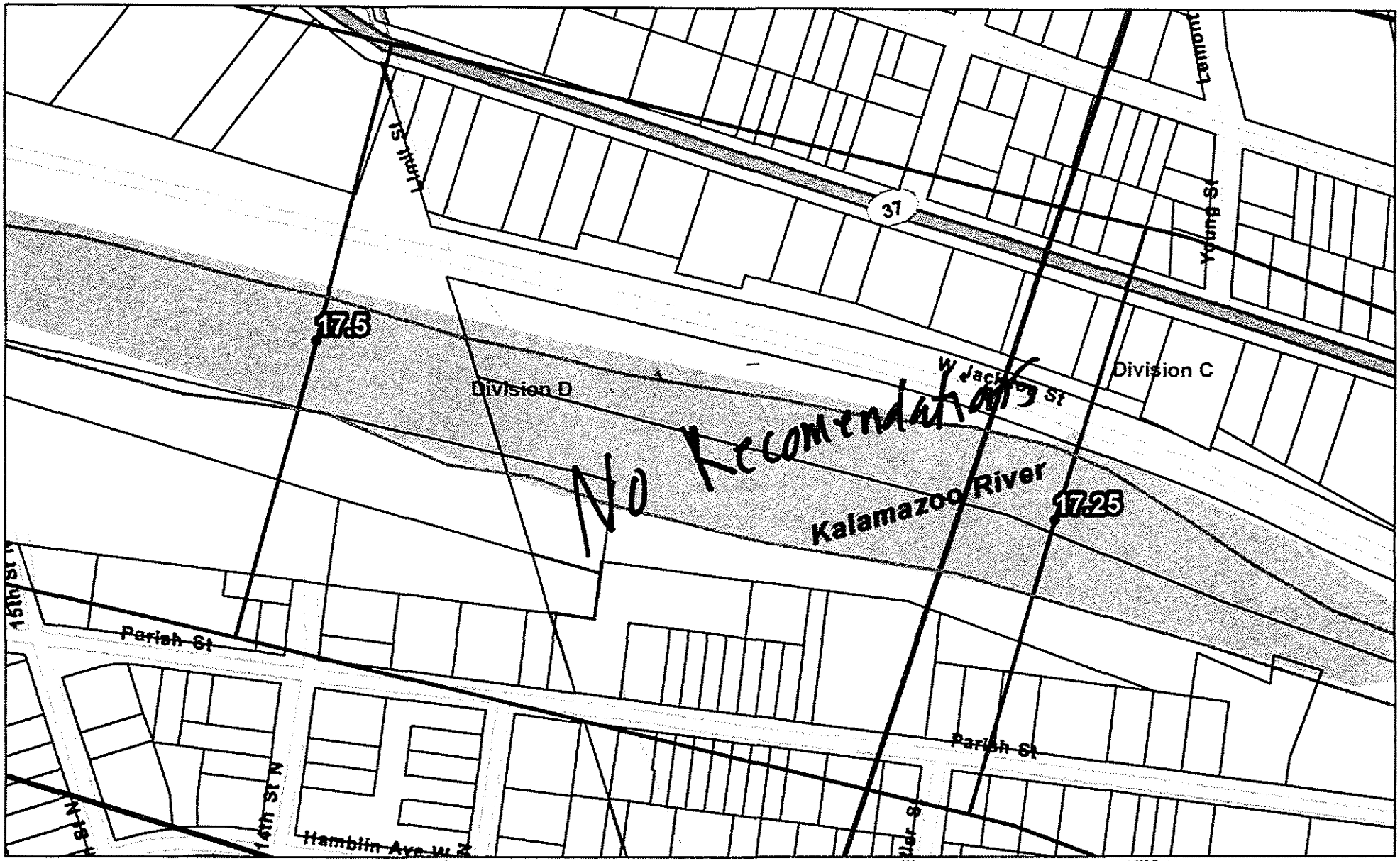
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuartermileMarkers
Parcels_1000ftBuffer
Shoreline
River_QuarterMiles
Divisions

Team 4

17.25 to 17.5

Division C: Mile Marker 17.25- 17.5 Left Bank while looking downstream

Image 2005 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business.

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 17.25-17.5 Right Bank While Looking Downstream										
No Operational Focus Areas identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 17.25-17.5
Right Bank While Looking Downstream

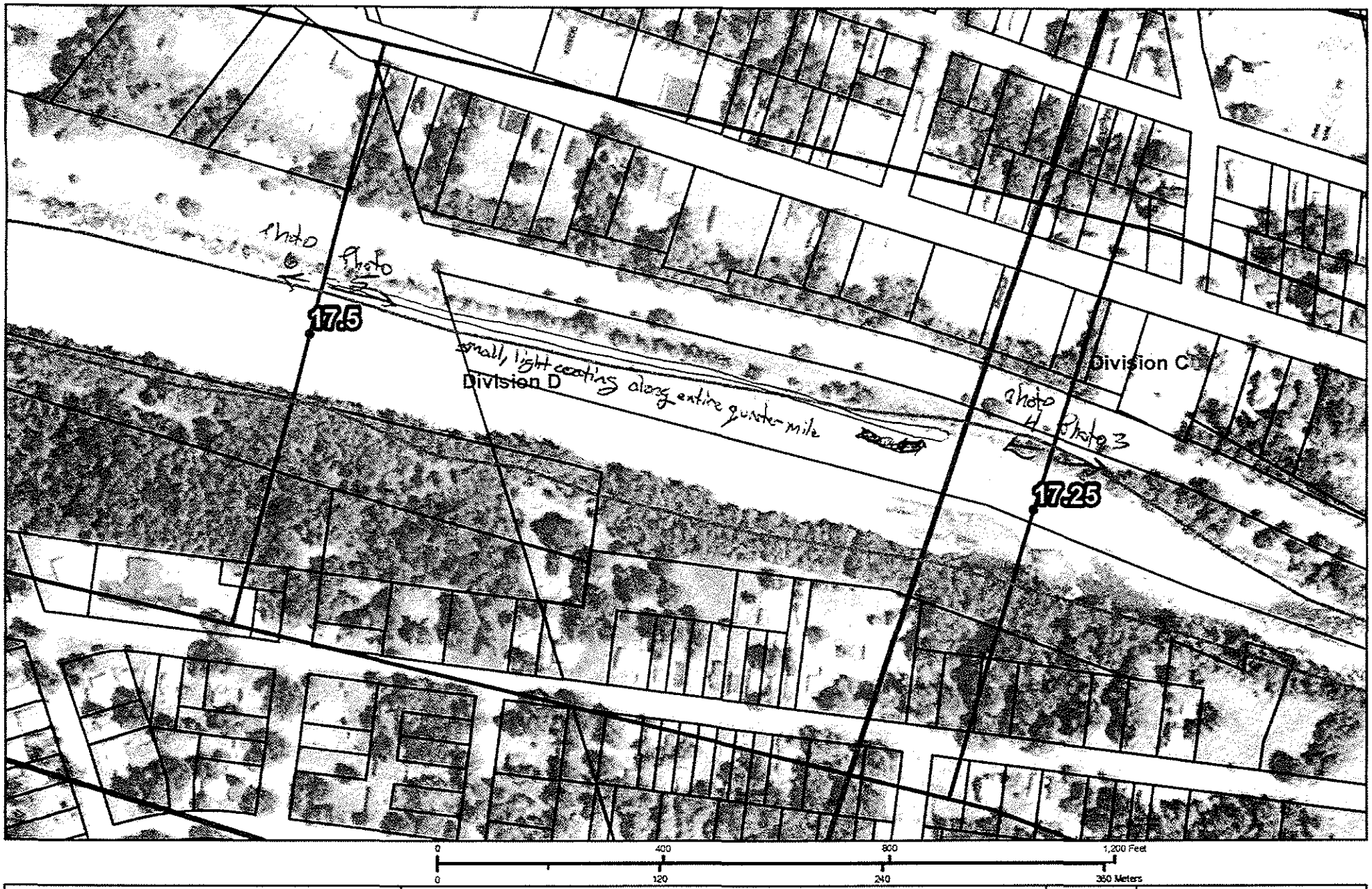
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuartermileMarkers
Parcels_1020ftBuffer
Shoreline
River_QuarterMiles
Divisions

Team #3
8/29/10

17.25 to 17.5

Division C: Mile Marker 17.25- 17.5 Right Bank while looking downstream

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 6 Sept '10 **Time:** AM / PM

Operations Division: D **Segment ID: From** 17.25 **Start MP to End MP** 17.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/ 73°F

Field Inspection Team

Enbridge Inspector: Dave Denton

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT points marked green.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

N R.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-8-10 **Time: AM / PM**

Operations Division: C **Segment ID: From** 17.25 **Start MP to End MP** 17.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Cloud

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

No Recommendations -

EPA-C-0494 is in Section MP 17.25 not in MP 17.5

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

None

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 17.25-17.5 Left Bank While Looking Downstream											
EPA-C-0494	Shoreline	SCAT T4 08/29/2010	Rocks under bridge were covered/coated. Shoreline was not consistently covered, only spotty areas were impacted. Photo 4 is at 17.25 looking upstream (end of zone).					3/4 of zone was concrete rip rap. Patchy sections of overhanging vegetation was stained/oiled. Should be removed. Rip Rap can be pressure washed where needed.	42.32814	-85.20778	(Y) / N
EPA-C-0496	Shoreline	SCAT T4 08/29/2010	Photo 5 is at MP 17.25 looking downstream. Photo 6 looking upstream at MP 17.5. minimal staining of fine roots - no Further cleanup recomendation. Overhanging vegetation and debris has been removed. AREA is CLEAR					Sheen on water in river	42.32870	-85.20902	(Y) / N

Printed Team Members Name: Jack Bass
Date: 9/8/10
Comments:
James Sallee
Bill Bates

Aerial photo identifies islands as being apart of 17.50, however land marking identifies them as being apart of 17.25

Note: On map both these operational focus areas are located on both the left and right bank, they are located on left bank, SCAT as left bank points.

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 17.25-17.5 Right Bank While Looking Downstream											
No Operational Focus Areas identified.											

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 17.25 **to MP** 17.50 **Segment Length: 0.25 mile**

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley	07-Sept-2010 (date)	Enbridge
Signature Stephen Ball	9/7/10 (date)	EPA

4. **SCAT Reassessment**

Signature Jack W. Boss	9/8/10 (date)	Enbridge
Signature William J. Bates	9/8/10 (date)	EPA
Signature James Sallee	9-8-10 (date)	MDNRE

5. **EPA**

Signature Gerry Larson	9/16/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0055 – Looking southwest at left descending bank.



Photo 0056 – Looking northwest at right descending bank.

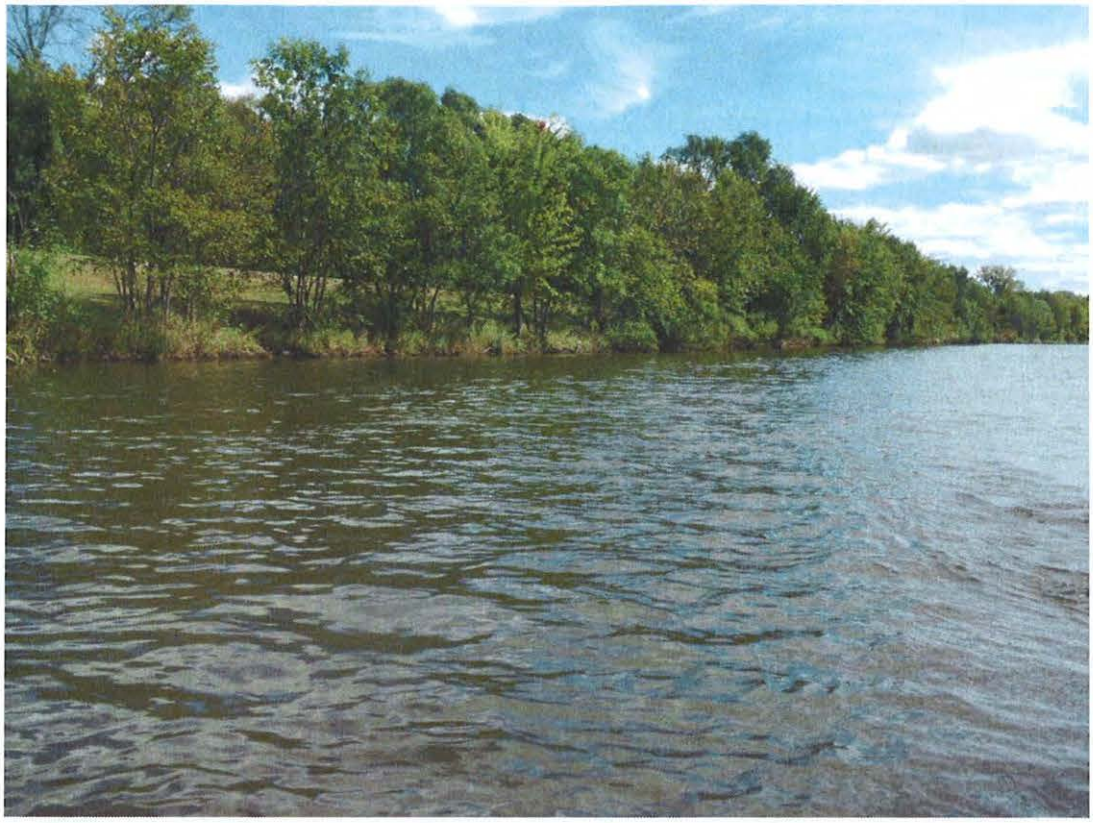


Photo 0057 – Looking northeast at right descending bank.



Photo 0058 – Looking southeast at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 17.75 – MP 17.50 to 17.75

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 17.75 had light oiling on the left descending bank and light oiling on the right descending bank. The left descending bank also had oiled debris and oiled vegetation. The right descending bank had some areas of pooled oil. The overbank areas contained no areas of oil requiring clean-up and islands were absent. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 17.75 consisted of the following:

- Woody vegetation less than 2" in diameter removed
- Removal of oiled vegetation leaving roots intact
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris
- Removal of overhanging limbs

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along left descending bank near GPS-Points SCD1-13, SCD1-14
- Oiled bushes on left descending bank near MP 17.75
- Lightly stained trees on right descending bank

Segment 17.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
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      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

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  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

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CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
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Surface Oiling Descriptors - Type

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SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

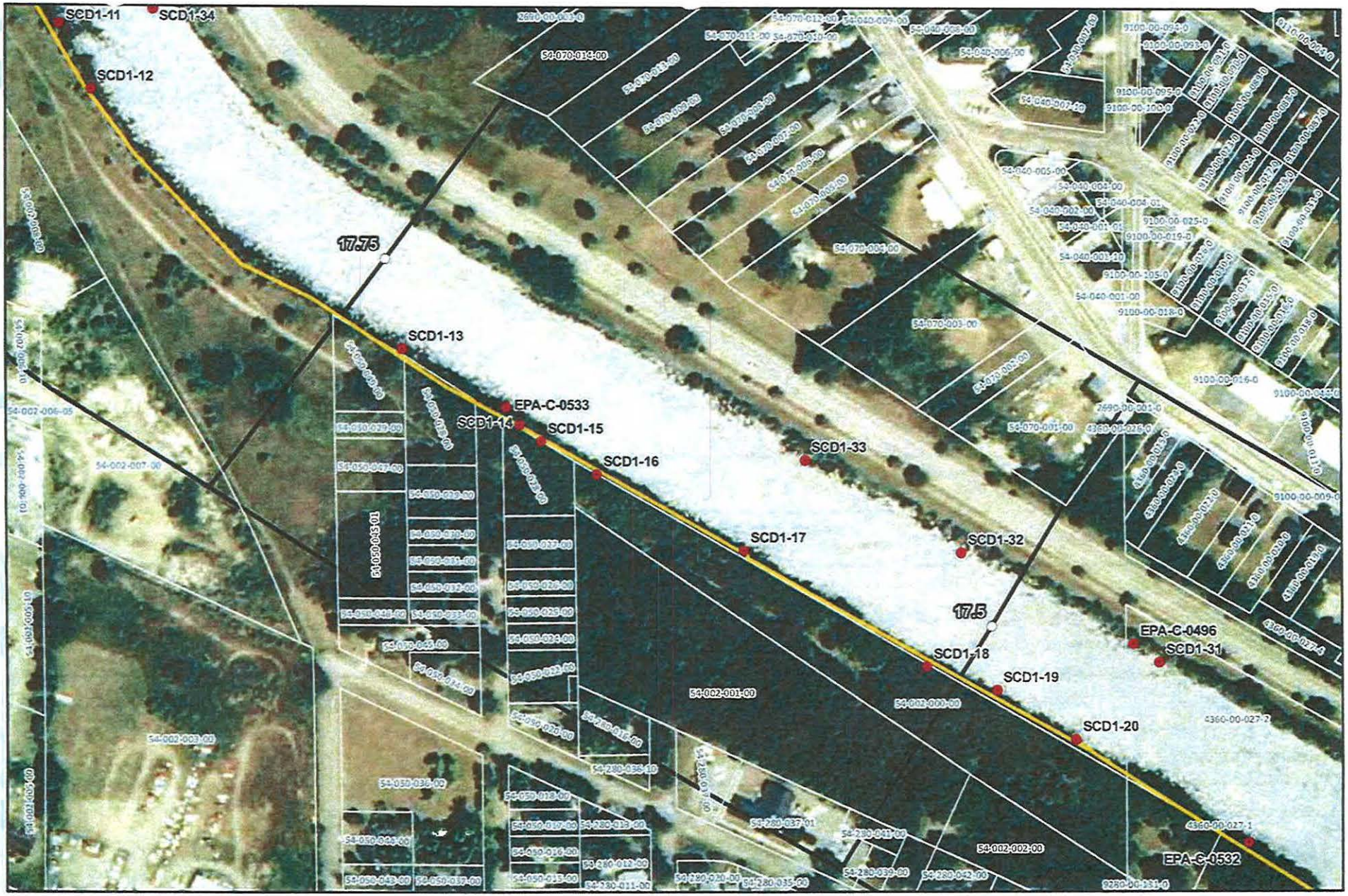
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

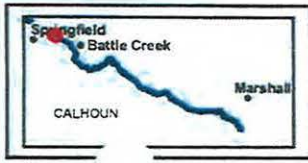
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 17.5-17.75 Left Bank While Looking Downstream										
SCD1-13	Shoreline	Shoreline Assessment	X		X	X	Heavily coated bank, tree limbs, and up into sloped bank - scrape, cut, and remove.	scrape, cut, remove	42.33118	-85.21487
SCD1-14	Shoreline	Shoreline Assessment	X		X	X	5' x 5' spotted coat on shoreline and overhanging vegetation. Also coated debris field (0.5 yd).	cut vegatation	42.33080	-85.21405
SCD1-15	Shoreline	Shoreline Assessment	X			X	Debris field coated on debris in water and shoreline.	remove debris	42.33072	-85.21390
SCD1-16	Shoreline	Shoreline Assessment	X		X		Shoreline 6" from edge. High volume flush and collect to boom & snare. Use 2" trash pump.	high volume flush and collect boom	42.33055	-85.21352
SCD1-17	Shoreline	Shoreline Assessment				X	Debris field on wood pile in water. Remove and dispose.	remove debris	42.33017	-85.21250
SCD1-18	Shoreline	Shoreline Assessment	?		X	X	Overhanging soaked vegetation - cut and remove. Some small oil droplets on shore.	cut remove overhanging vegatation	42.32958	-85.21123
EPA-C-0533	Shoreline	SCAT T4 08/29/2010	Photo 6 looking upstream					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.33089	-85.21415





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 17.5-17.75
Left Bank While Looking Downstream

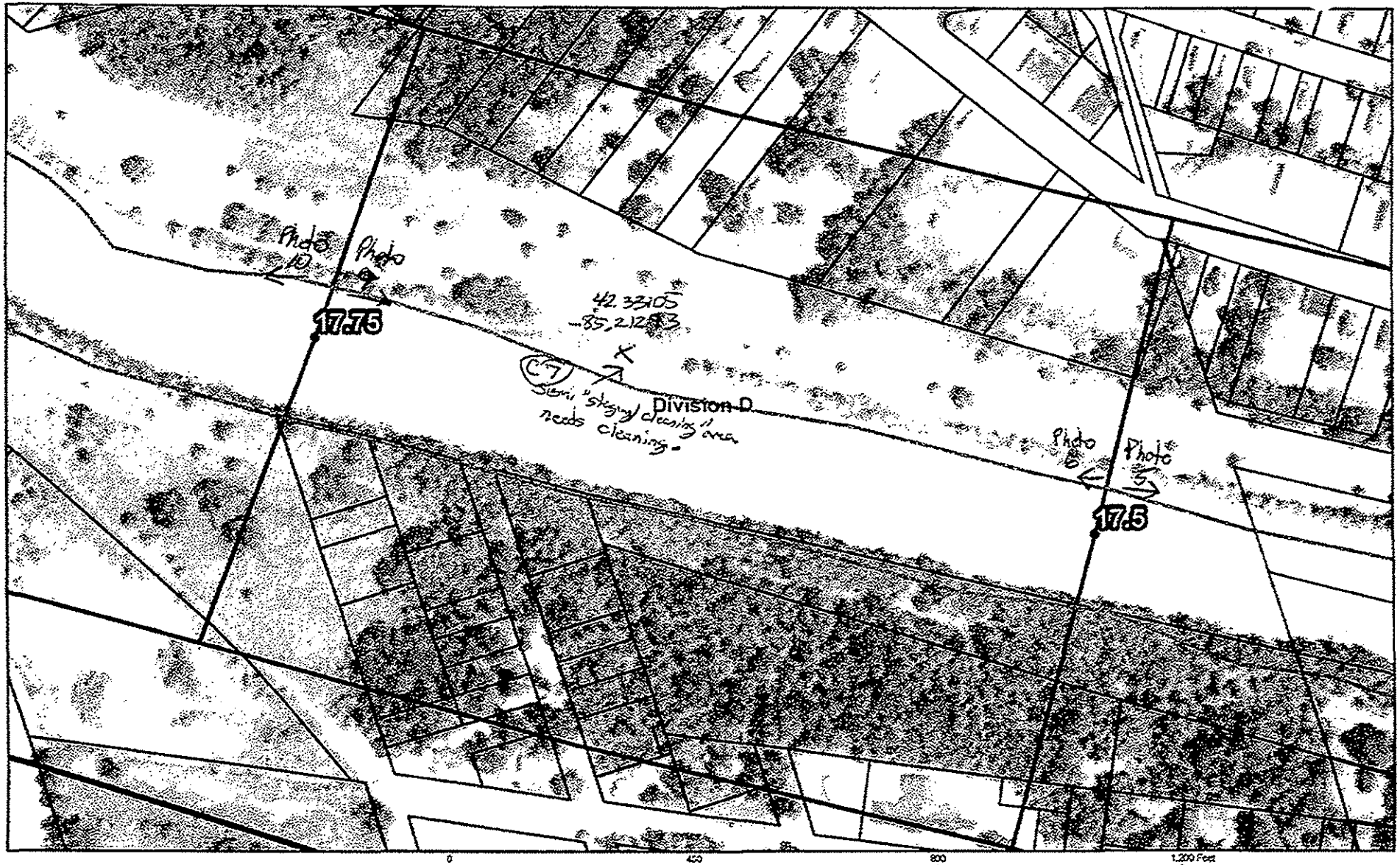
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Mich... South Feet



Team # 3
8/29/2010

17.5 to 17.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth, Down to Business

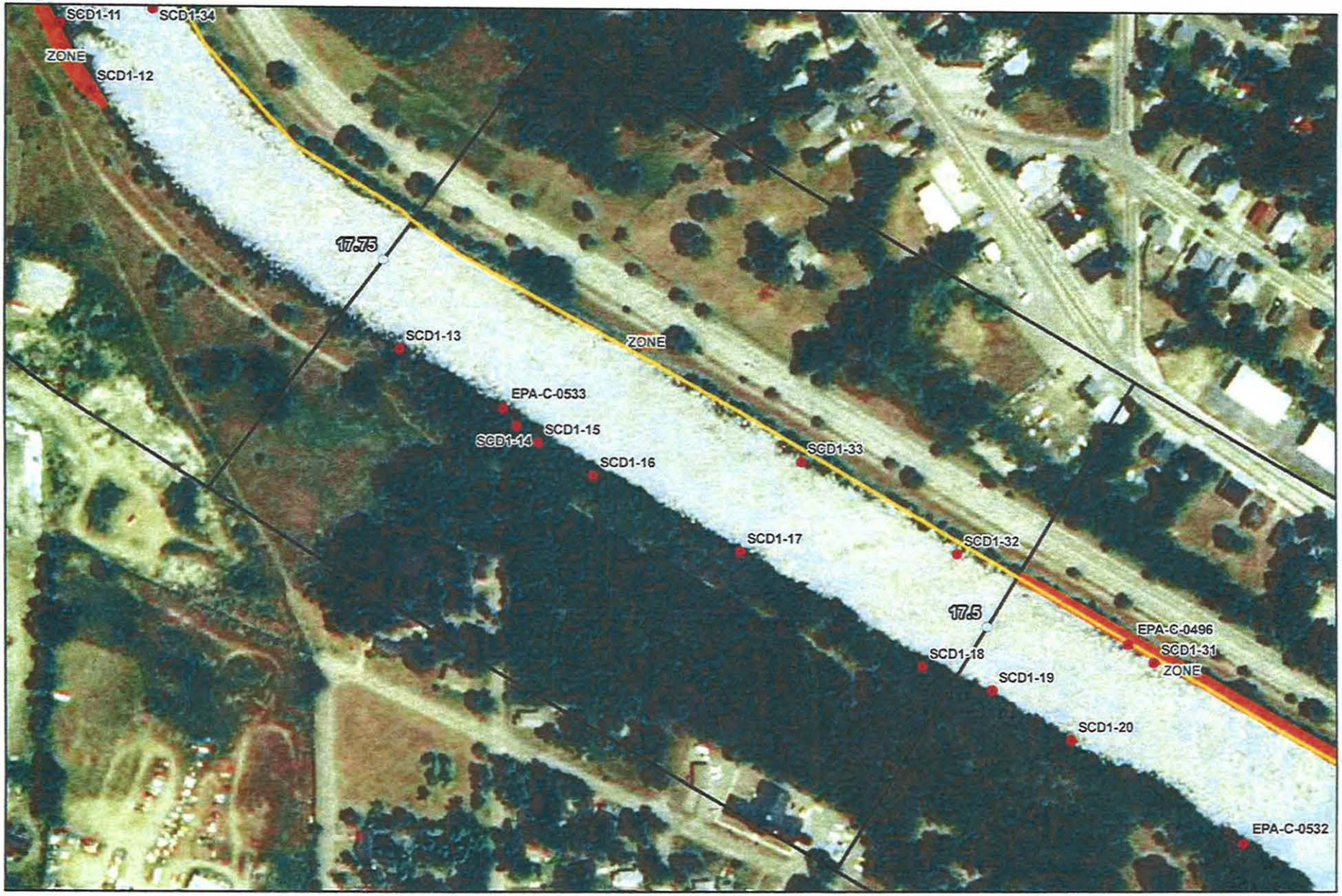
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 17.5-17.75 Right Bank While Looking Downstream										
SCD1-32	Shoreline	Shoreline Assessment	X	X	X	X	Pooled areas and overhanging veg. Cut, collect, and dispose. Flush to boom or snare.	flush, remove boom, remove pools	42.33017	-85.21100
SCD1-33	Shoreline	Shoreline Assessment	X	X	X	X	Pooled recoverable oil. Use hand snare. Also coated hanging vegetation. Cut and dispose. Oiling high on shoreline consistently downstream. High volume wash, boom, or snare.	remove pool of oil with hand snare, cut and dispose of vegatation, high volume wash, boom, or snare	42.33063	-85.21208





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division D: Mile Marker 17.5-17.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
CRAFT INSPECTION REPORT (CIR)

Date: 5-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 17.50 Start MP to End MP 17.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 78° F

Field Inspection Team

Enbridge Inspector: Doug Deren [signature] ENBRIDGE

Division Supervisor(Contractor): [signature] O'Brien 9-5-10

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

→ All shoreline assessments were completed by operations prior to inspection

→ No hotshot operations req'd.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

→ No overbank recommendations for this sections

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

→ All shoreline assessments were completed by operations prior to inspection

→ No hotshot operations req'd

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

→ No overbank recommendations for this section.

Revised9/01/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-5-10 **Time:** AM (PM)

Operations Division: D **Segment ID: From** 17.5 **Start MP to End MP** 17.75 **Segment Length:** 0.25 mile

Bank: (LDB) (RDB) ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector: David Pesses

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 8 areas of concern according to the SCAT report.

Clean up required is flushing, vegetation removal, debris removal, overhanging limbs, and pooled oil removal

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 8 areas of concern according to the SCAT report.
All areas have been taken care of.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 17.5-17.75 Left Bank While Looking Downstream											
SCD1-13	Shoreline	Shoreline Assessment	X		X	X	Heavily coated bank, tree limbs, and up into sloped bank - scrape, cut, and remove.	scrape, cut, remove	42.33118	-85.21487	(Y) N
SCD1-14	Shoreline	Shoreline Assessment	X		X	X	5' x 5' spotted coat on shoreline and overhanging vegetation. Also coated debris field (0.5 yd).	cut vegatation	42.33080	-85.21405	(Y) N
SCD1-15	Shoreline	Shoreline Assessment	X			X	Debris field coated on debris in water and shoreline.	remove debris	42.33072	-85.21390	(Y) N

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil ~~Removal~~	Vegetation ~~Removal~~	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 17.5-17.75 Left Bank While Looking Downstream											
SCD1-17	Shoreline	Shoreline Assessment				X	Debris field on wood pile in water. Remove and dispose.	remove debris	42.33017	-85.21250	(Y) / N
SCD1-18	Shoreline	Shoreline Assessment	?		X	X	Overhanging soaked vegetation - cut and remove. Some small oil droplets on shore.	cut remove overhanging vegatation	42.32958	-85.21123	(Y) / N
EPA-C-0533	Shoreline	SCAT T4 08/29/2010	Photo 6 looking upstream					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.33089	-85.21415	(Y) / N

Print Inspector Name: Kathleen Fairchild (DNRE), Michelle Kerr (US EPA), Karen Van Tiem (NRG)

Date: 9/6/10

Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 17.5-17.75 Right Bank While Looking Downstream											
SCD1-32	Shoreline	Shoreline Assessment	X	X	X	X	Pooled areas and overhanging veg. Cut, collect, and dispose. Flush to boom or snare.	flush, remove boom, remove pools	42.33017	-85.21100	(Y) / N
SCD1-33	Shoreline	Shoreline Assessment	X	X	X	X	Pooled recoverable oil. Use hand snare. Also coated hanging vegetation. Cut and dispose. Oiling high on shoreline consistently downstream. High volume wash, boom, or snare.	remove pool of oil with hand snare, cut and dispose of vegatation, high volume wash, boom, or snare	42.33063	-85.21208	(Y) / N

Print Inspector Name: Kathleen Fairchild (DNRE), Michelle Kerr (US EPA), Karen Van Tiem (NRG)

Date: 9/10/10

Comments:

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: D **Segment ID: From MP** 17.50 **to MP** 17.75 **Segment Length: 0.25 mile**

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley	05-Sept-2010 (date)	Enbridge
Signature	9/5/10 (date)	EPA

4. **SCAT Reassessment**

Signature Karen Van Tiem	09-06-10 (date)	Enbridge
Signature MICHELLE KERR	09.06.10 (date)	EPA
Signature Kathleen Fairchild	9-6-10 (date)	MDNRE

5. **EPA**

Signature GARY LIPSON	9/16/10 (date)	EPA Division Supervisor

Appendix E
Photos

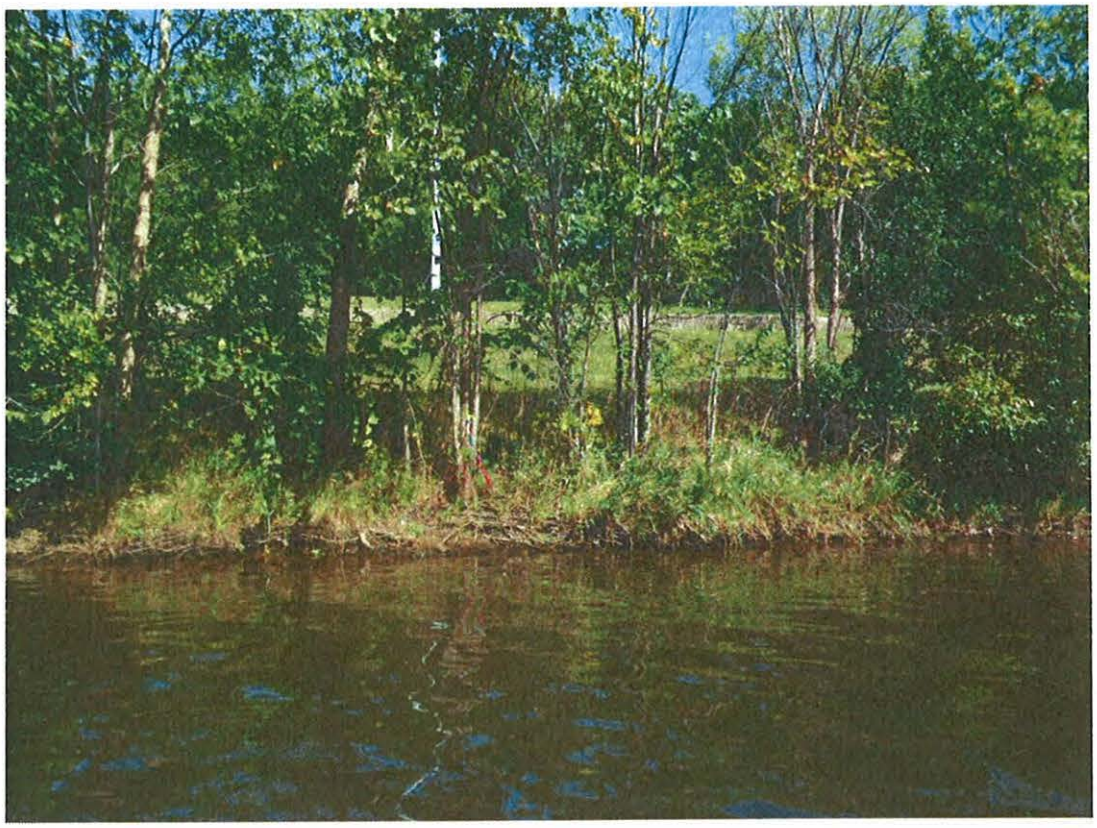


Photo 0059 – Looking north at right descending bank. Near SCD1-32.



Photo 0060 – Looking north at right descending bank. Near SCD1-33.

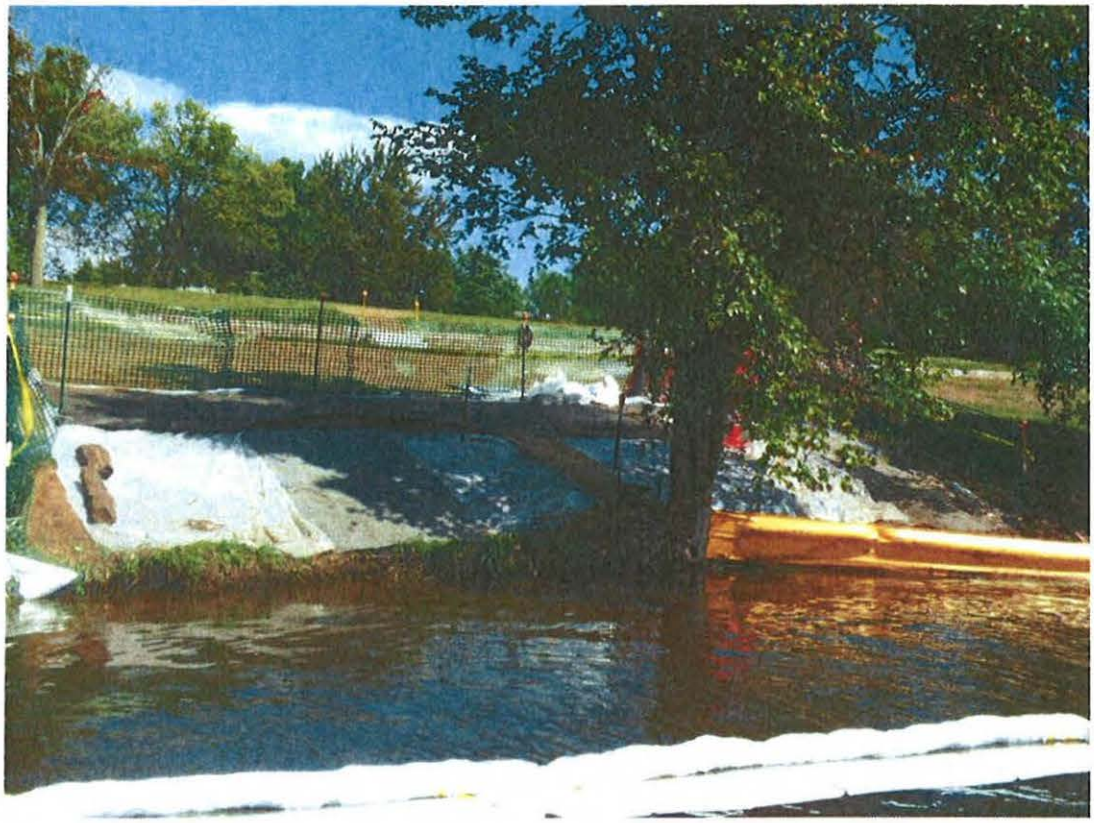


Photo 0061 – Looking north at right descending bank. Near C7.



Photo 0062 – Looking northeast at right descending bank. Near C7.



Photo 0063 – Looking southwest at left descending bank. Near D1-13, D1-14, D1-15, D1-16, 0533.



Photo 0064 – Looking south at left descending bank. Near D1-13, D1-14, D1-15, D1-16, 0533.

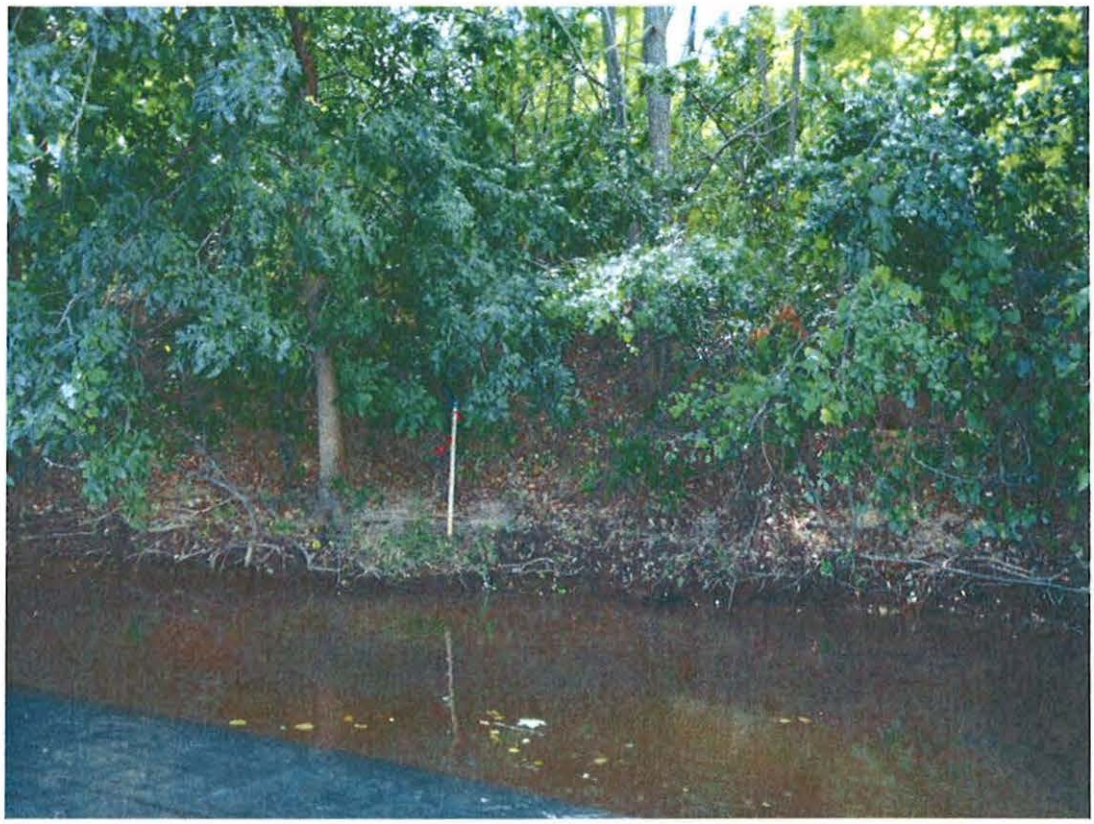


Photo 0065 – Looking south at left descending bank. GPS points D1-13, D1-14, D1-15, D1-16, 0533.



Photo 0066 – Looking south at left descending bank. Near SCD1-17.

Field Photo Log – Segment MP 17.75



Photo 0067 – Looking southeast at left descending bank. Near SCD1-18.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 18.00 – MP 17.75 to 18.00

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 18.00 had light oiling on the left and right descending banks. Oiled vegetation was present on left and right banks. Small pockets of pooled oil and oily debris were present on the right descending bank. The overbank areas contained no areas of oil requiring clean-up with light level of oil present at the island. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 18.00 consisted of the following:

- Woody vegetation less than 2" in diameter removed
- Removal of oiled vegetation leaving roots intact up to 10' from waterline
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris
- Removal of overhanging vegetation

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody vegetation on the left descending bank near SCD1-11

Segment 18.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

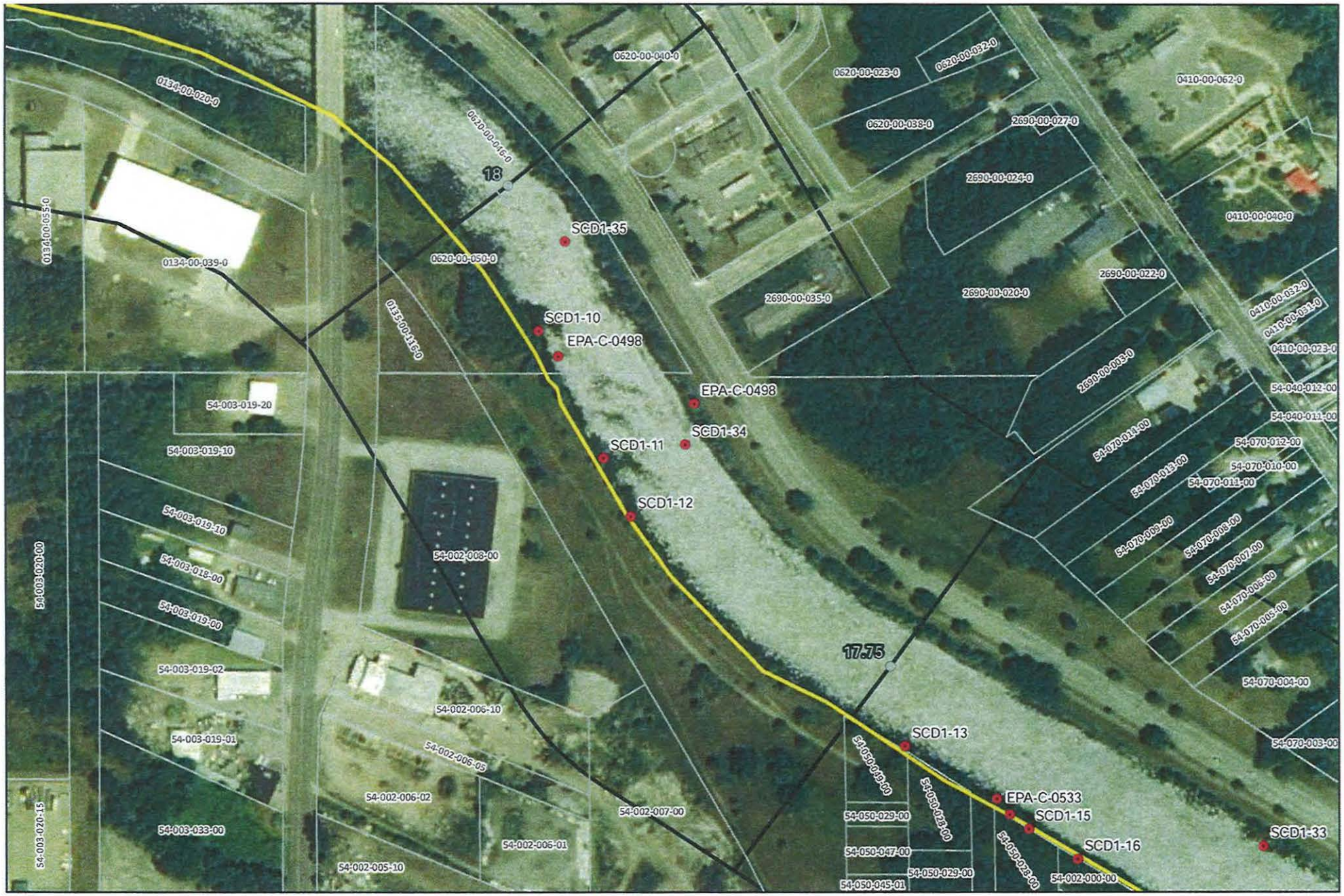
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 17.75-18.0 Left Bank While Looking Downstream										
SCD1-10	Shoreline	Shoreline Assessment	X		X		Thickly oiled tree overhanging vegetation.	Cut and remove oil soaked vegetation.	42.33355	-85.21775
SCD1-11	Shoreline	Shoreline Assessment	X		X		Thickly oiled tree overhanging vegetation.	Cut and remove oil soaked vegetation.	42.33282	-85.21723
SCD1-12	Shoreline	Shoreline Assessment	X		X	X	Thickly coated grassy bank (20'x10')	Dig, cut, and remove. High volume wash. Collect with boom or snares.	42.33248	-85.21702





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 17.75-18
Left Bank While Looking Downstream

Enbridge e Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

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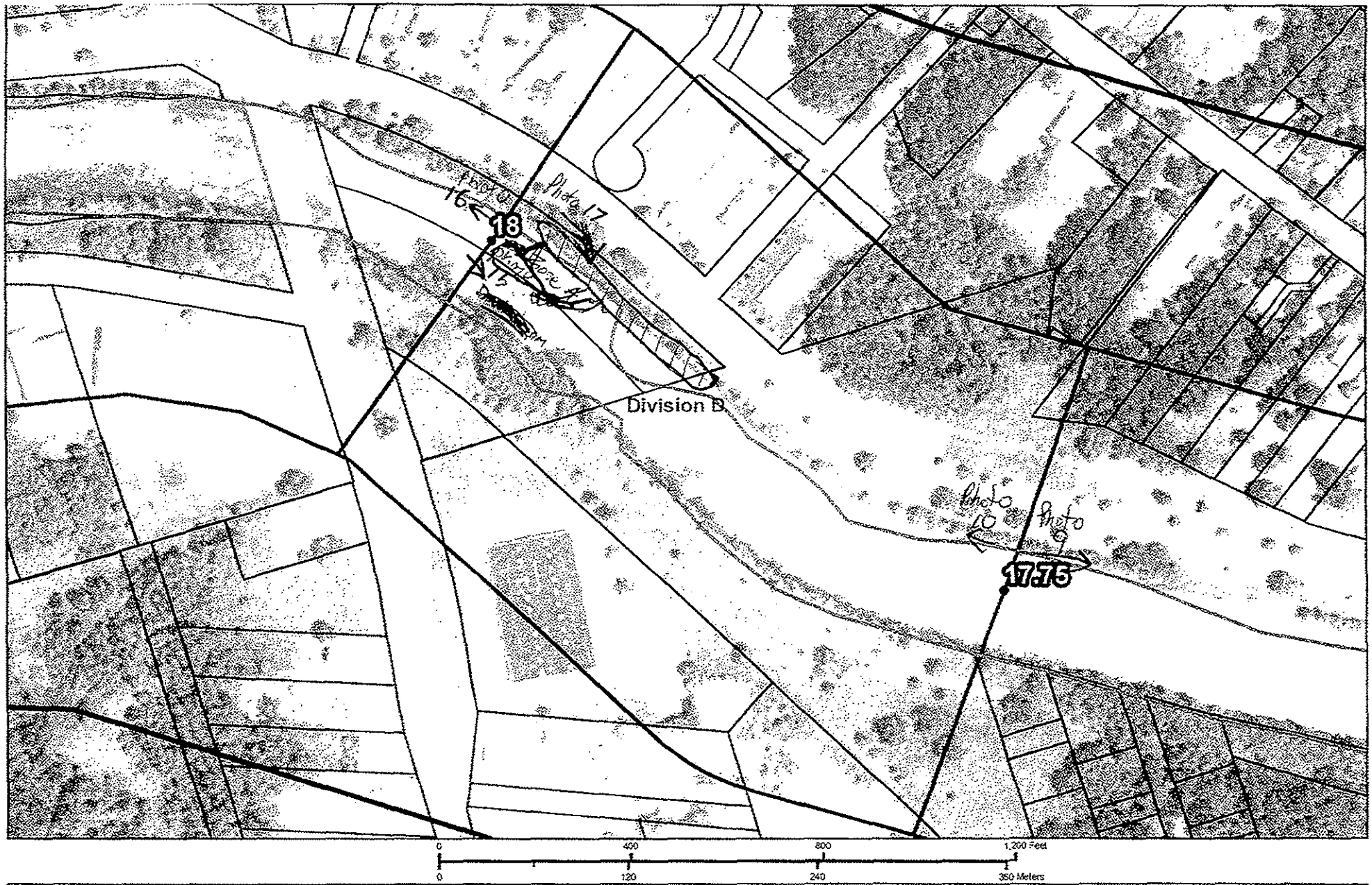
Co ystem: NAD 1983 State
P n South Feet



Quartermile Markers
Parcels_100ft Buffer
Shoreline
River_QuarterMiles
Divisions

Team #3
8/29/2010

42.33314
-85.21653

17.75 to 18.0

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 49

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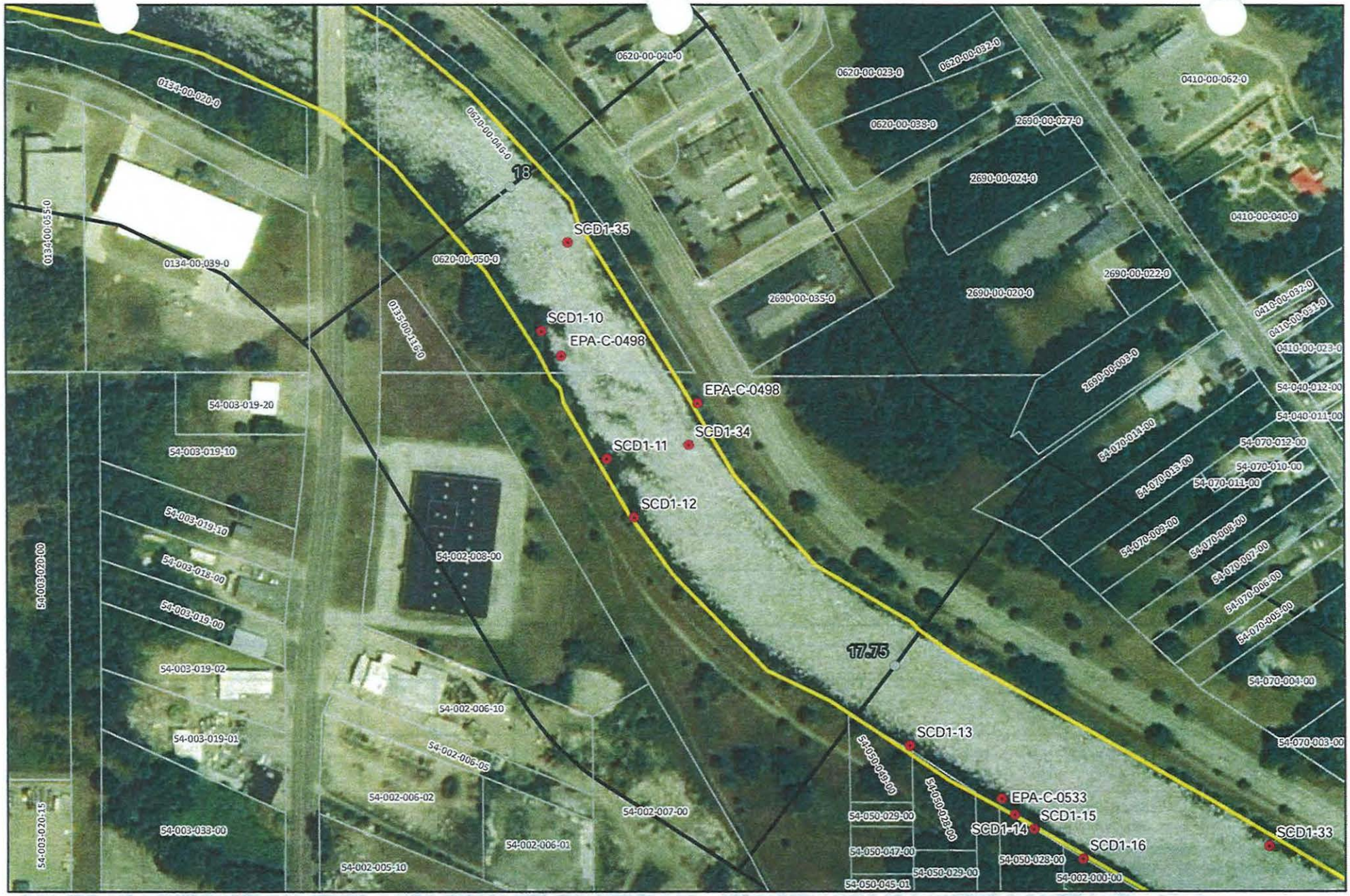
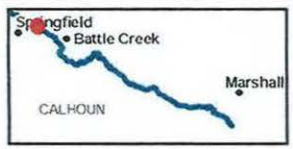
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 17.75-18.0 Island										
EPA-C-0498	Shoreline	SCAT T4 08/29/2010					Photo 8 downstream	Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.33341	-85.21760





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 17.75-18 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

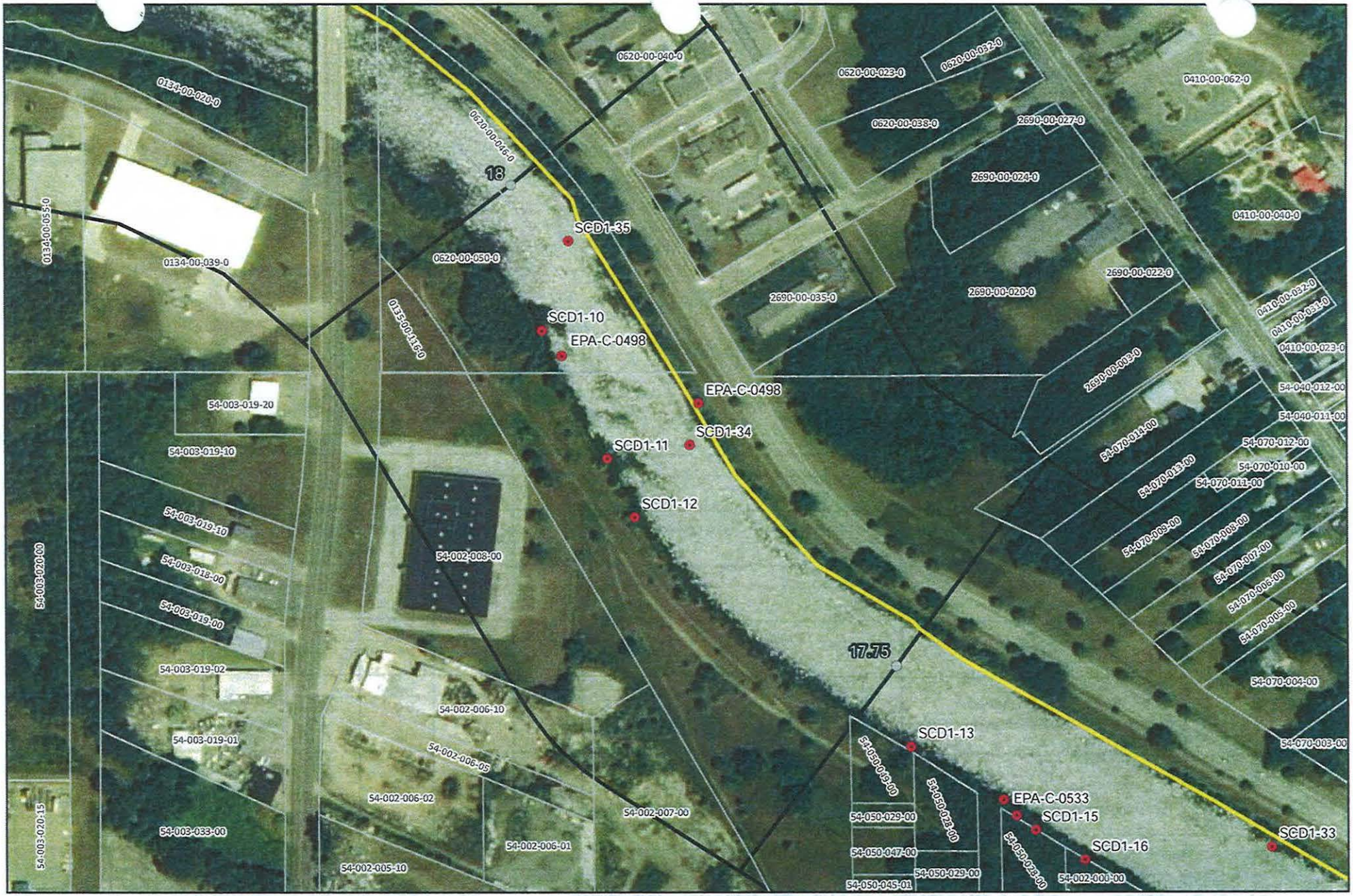
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 17.75-18.0 Right Bank While Looking Downstream										
SCD1-34	Shoreline	Shoreline Assessment	X		X	X	Bank filmed, and filmed/coated vegetation at 3' above water level. Cut vegetation and remove debris. High volume flush bank to capture with booms or snares.	Cut vegetation and remove debris, high volume flush	42.33290	-85.21660
SCD1-35	Shoreline	Shoreline Assessment	X	X	X	X	Hand snare small pockets of pooled oil. Shoreline oiled 2m into woods, debris fields. High power flush and capture.	Remove small pockets of pooled oil, high power flush and capture	42.33407	-85.21755





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 17.75-18
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 9-Sept-10 Time: AM / PM

Operations Division: 7 Segment ID: From 17.75 Start MP to End MP 18.0 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 71°F

Field Inspection Team

Enbridge Inspector: Dave Doran

Division Supervisor(Contractor): STEVE TAYLOR

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

- All SCAT points marked green.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

- no overbank

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

- SCD 1-3 ✓ marked red
  - ↳ signed green 9-Sept-10.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

- No overbank.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-9-10 **Time: AM / PM**

Operations Division: 1 **Segment ID: From** 17.75 **Start MP to End MP** 18.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

Reviewed 5 areas of concern from the SCAT report Clean up required is Flushing, Pooling, Veg. & debris removal. Also the SCAT report showed an Island and there is not one in this section

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected both the LDB + RDB and all clean up is complete according to the SCAT recommendations.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 17.75-18.0 Left Bank While Looking Downstream											
SCD1-10	Shoreline	Shoreline Assessment	X		X		Thickly oiled tree overhanging vegetation.	Cut and remove oil soaked vegetation.	42.33355	-85.21775	(Y) / N
SCD1-11	Shoreline	Shoreline Assessment	X		X		Thickly oiled tree overhanging vegetation.	Cut and remove oil soaked vegetation.	42.33282	-85.21723	(Y) N
SCD1-12	Shoreline	Shoreline Assessment	X		X	X	Thickly coated grassy bank (20'x10')	Dig, cut, and remove. High volume wash. Collect with boom or snares.	42.33248	-85.21702	(Y) / N

Printed Team Members Names:
Date: 9-11-10
Comments:

- we removed 1/2 bag of oiled vegetation below SCD1-10 and SCD1-11

James Sallee, MDNRE
Ross DelRosario, USEPA
Team 4 9/11/10
Amanda Bohrenblust

SCD1-12 is located on map within the previous segment, please SCAT according to this sheet.

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 17.75-18.0 Right Bank While Looking Downstream											
SCD1-34	Shoreline	Shoreline Assessment	X		X	X	Bank flimed, and filmed/coated vegetation at 3' above water level. Cut vegetation and remove debris. High volume flush bank to capture with booms or snares.	Cut vegetation and remove debris, high volume flush	42.33290	-85.21660	(Y) / N
SCD1-35	Shoreline	Shoreline Assessment	X	X	X	X	Hand snare small pockets of pooled oil. Shoreline oiled 2m into woods, debris fields. High power flush and capture.	Remove small pockets of pooled oil, high power flush and capture	42.33407	-85.21755	(Y) / N

Printed Team Members Names: James Saller, MDNRE
Date: 9-11-10
Comments: Ross DEL ROSARIO, USEPA Team 4
Amanda Bohnenblust 9/11/10

→ Booms present

The MP in the river are slightly off, but all sites are flagge

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill											
SCAT REASSESSMENT SHEET											
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 17.75-18.0 Island											
EPA-C-0498	~~Shoreline~~	~~SCAT T4~~ 08/29/2010	~~Photo 8 downstream~~					Refer to the Kalamazoo River/Enbridge ~~Spill Cleanup Recommendation Methods~~	42.33341	-85.21760	Y / N

Printed Team Members Names:
Date: 9-11-10
Comments: There is no island in this segment, and it was combined in the office

James Sollee, MONRE 9/11/10
Ross DELROSARIO, USEPA Team 4
Amanda Bohnenblus

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 17.75 to MP 18.00 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ron Bosley 10-Sept-2010 (date) Enbridge

Signature Eduardo Rovira 9/10/10 (date) EPA
Eduardo Rovira

4. **SCAT Reassessment**

Signature Amanda Bonelli 9/11/10 (date) Enbridge

Signature ROSS DEL ROSARIO Ross del Rosario 9-11-10 (date) EPA

Signature MDNRE Jonas Sallee 9-11-10 (date) MDNRE
Jonas Sallee,

5. **EPA**

Signature GARY LIPSON 9/15/10 (date) EPA Division Supervisor

Appendix E
Photos



Photo 0287 – Looking southwest at left descending bank. Near SCD1-10.



Photo 0288 – Looking southwest at left descending bank. Near SCD1-11.



Photo 0289 – Looking west at left descending bank. Near SCD1-11.



Photo 0290 – Looking south at left descending bank. Near SCD1-12.



Photo 0291 – Looking north at right descending bank. Near SCD1-34.



Photo 0292 – Looking northwest at right descending bank. Near SCD1-35.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 18.25 – MP 18.00 to 18.25

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 18.25 had light oiling on the left descending bank and light oiling on the right descending bank. Oiled vegetation was present on the left descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 18.25 consisted of the following:

- Woody vegetation less than 2" in diameter removed
- Removal of oiled vegetation leaving roots intact up to 10' from waterline
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris
- Removal of overhanging vegetation

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 18.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

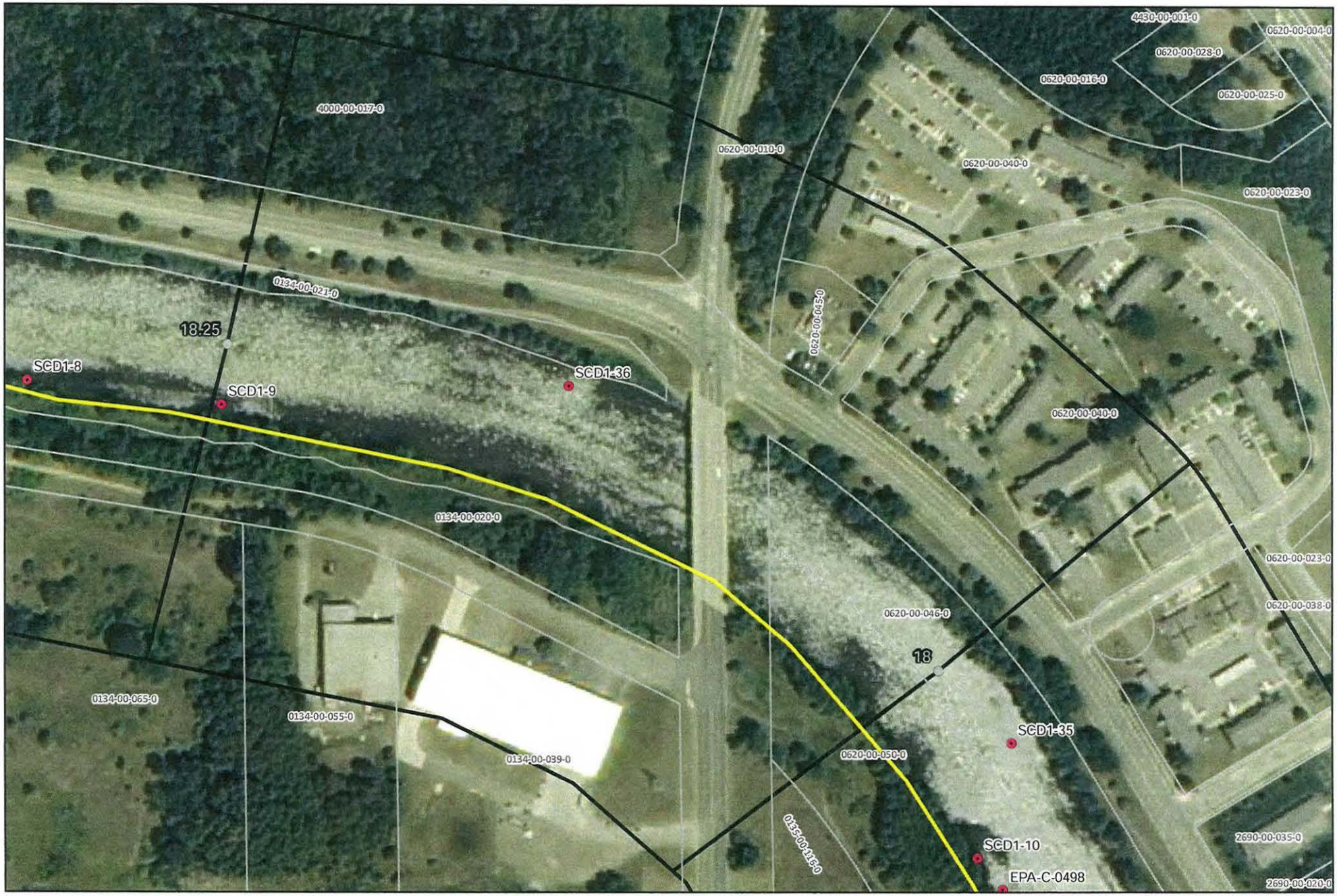
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

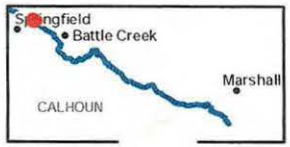
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 18.0-18.25 Left Bank While Looking Downstream										
SCD1-9	Shoreline	Shoreline Assessment	X		X	X	Thick oil soaking hanging vegetation and between stump. Cut hanging vegetation and remove.	Cut hanging vegetation and remove	42.33555	-85.22238





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 18-18.25
Left Bank While Looking Downstream

Enbridge *Release Incident - Kalamazoo River Oil Spill*

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

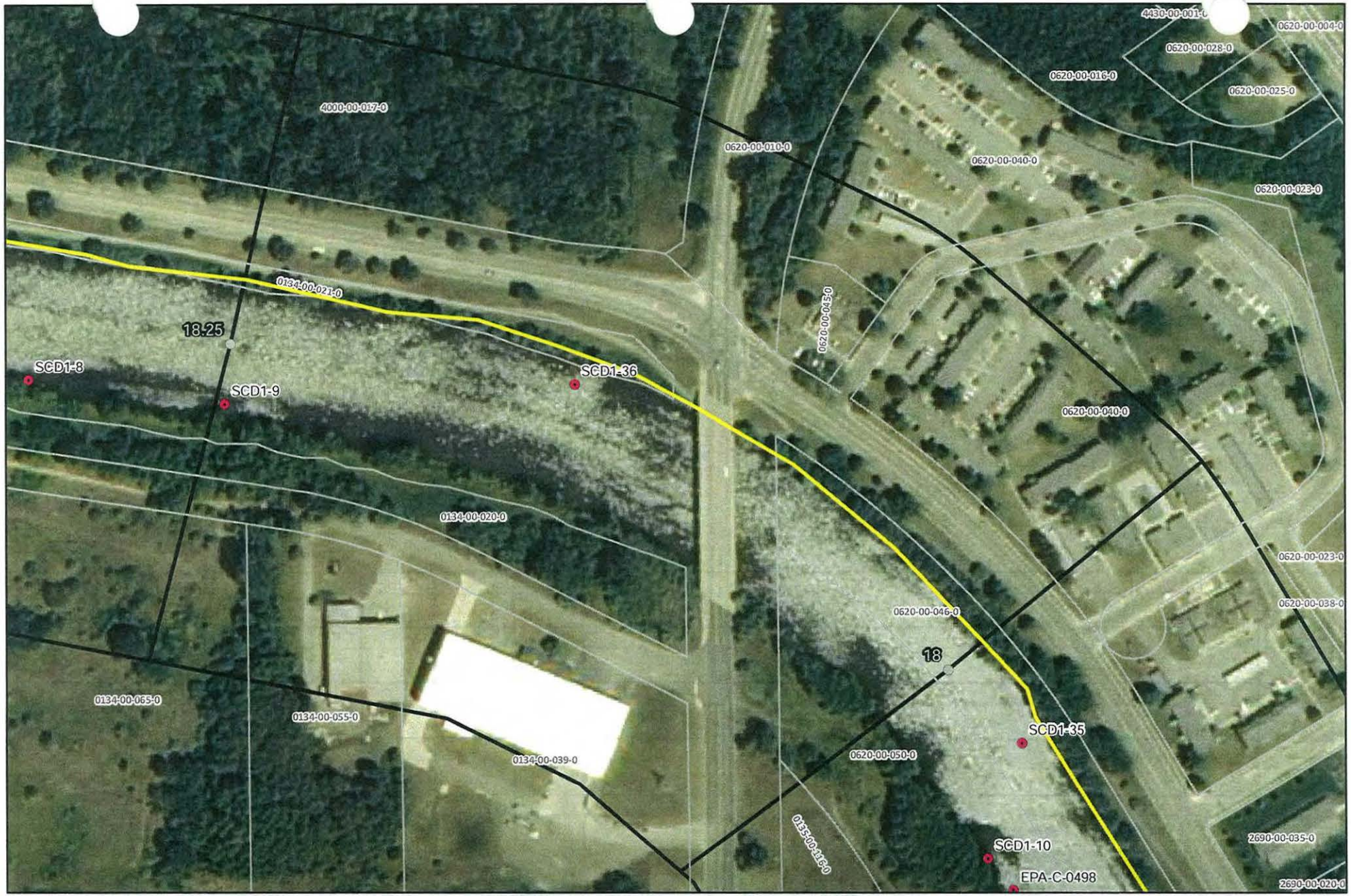
ENTRIX
www.entrix.com

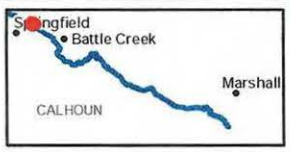
Cor
Pl

stem: NAD 1983 State
South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 18.0-18.25 Right Bank While Looking Downstream										
SCD1-36	Shoreline	Shoreline Assessment	X		X	X	Shoreline bank coated.	Cut and remove, or high volume flush to collect.	42.33565	-85.22027





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 18-18.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

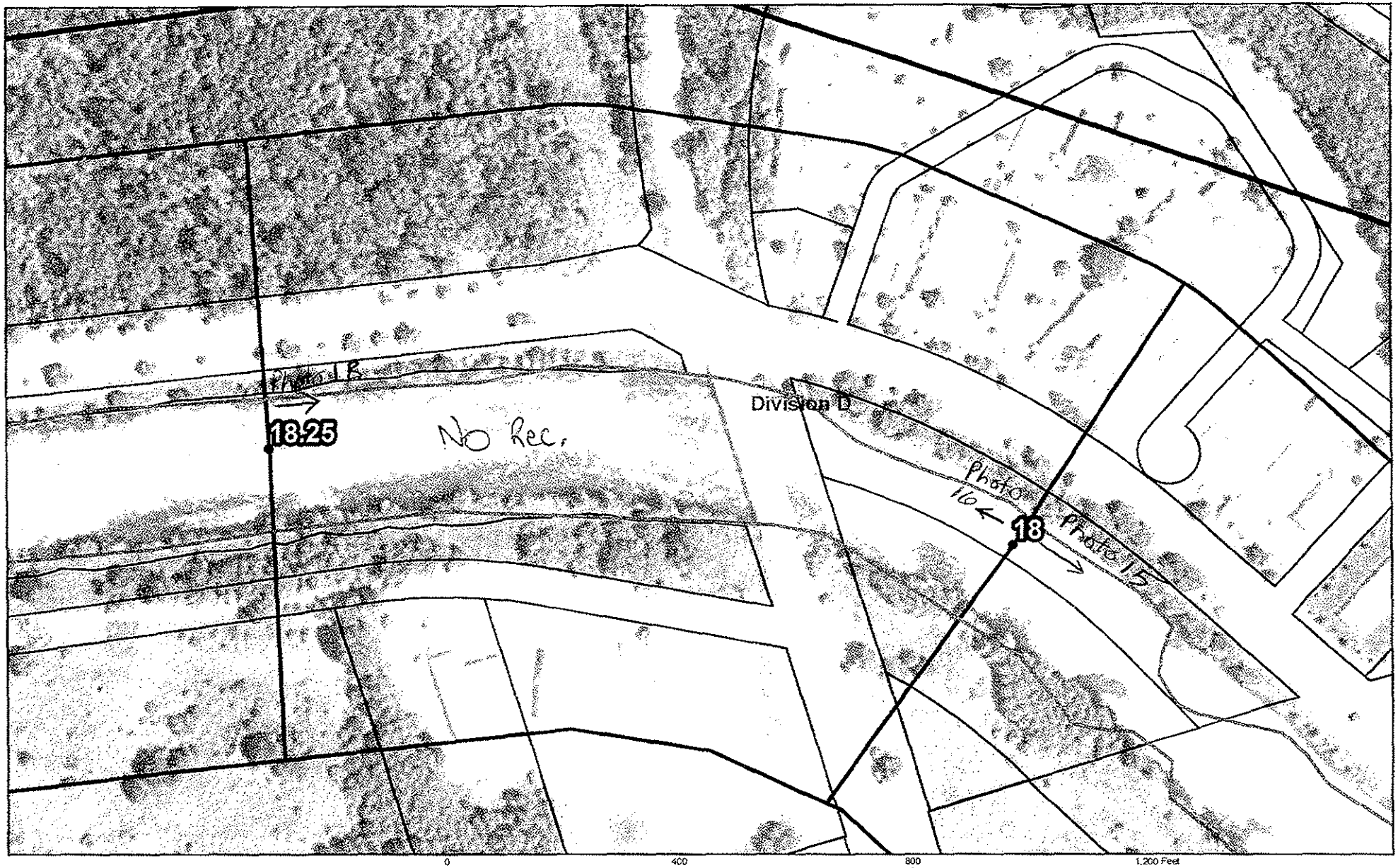
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuartermileMarkers
Parcels_1020ftBuffer
Shoreline
River_QuarterMiles
Divisions

18.0 to 18.25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

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Down to Earth, Down to Business

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Coordinate System: NAD 1983 STATE PLANE MICHIC ITH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
CRAFT INSPECTION REPORT (CIR)

Date: 5-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 18.0 Start MP to End MP 18.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 80° F

Field Inspection Team

Enbridge Inspector: Dave Deren. ENBRIDGE

Division Supervisor(Contractor): OBRIEN'S 9-5-10

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

- All shoreline assessments were completed by operations prior to inspection
- No hotshot operations req'd

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

- No overbank recommendations for this section

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

- All shoreline assessments were completed by operations prior to inspection

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

- No overbank recommendations for this section.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-5-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 18.0 **Start MP to End MP** 18.25 **Segment Length: 0.25 mile**

Bank: (LDB) / (RDB) ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector: David Passey

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 2 areas of concern according to the SCAT report.
Clean up required is Flushing, Veg. removal, debris removal.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 2 areas of concern according to the SCAT report.
Clean up required is complete.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division D: Mile Marker 18.0-18.25 Right Bank While Looking Downstream										
SCD1-36	Shoreline	Shoreline Assessment	X		X	X	Shoreline bank coated. Cut and remove, or high volume flush to collect.	42.33565	-85.22027	(Y) / N

Printed Team Members Names: Kathleen Fairchild (DNRE), Michelle Kerz (US EPA), Karen VanTiem (N.R.C)

Date: 9/6/10

Comments:

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 18.0-18.25 Left Bank While Looking Downstream											
SCD1-9	Shoreline	Shoreline Assessment	X		X	X	Thick oil soaking hanging vegetation and between stump. Cut hanging vegetation and remove.	Cut hanging vegetation and remove	42.33555	-85.22238	(Y) / N

Print Inspector Name: Kathleen Fairchild (DNRE), Michelle Keer (USEPA), Karen Van Tress (NRC)

Date: 9/6/10

Comments:

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: D **Segment ID: From MP** 18.00 **to MP** 18.25 **Segment Length: 0.25 mile**

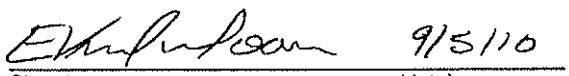
1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

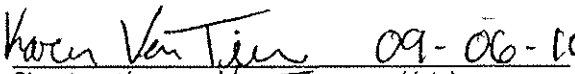


Signature Ken Costley (date) 05-Sept-2010 Enbridge



Signature (date) 9/5/10 EPA

4. **SCAT Reassessment**



Signature Karen Van Tiem (date) 09-06-10 Enbridge

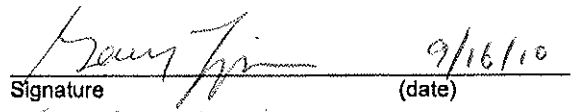


Signature MICHELLE KERR (date) 09.06.10 EPA



Signature Kathleen Fairchild (date) 9-6-10 MDNRE

5. **EPA**



Signature GARY LIPSON (date) 9/16/10 EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 18.25



Photo 0068 – Looking northwest at right descending bank. Near SCD1-36.



Photo 0069 – Looking southwest at left descending bank. Near SCD1-36.

Field Photo Log – Segment MP 18.25



Photo 0070 – Looking northwest at right descending bank. Near SCD1-36.



Photo 0071 – Looking southwest at left descending bank. Near SCD1-36.

Field Photo Log – Segment MP 18.25



Photo 0072 – Looking southeast at left descending bank. Near SCD1-9.



Photo 0073 – Looking northeast at right descending bank. Near SCD1-36.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 18.50 – MP 18.25 to 18.50

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 18.50 had light oiling on the left descending bank, including oiled vegetation, pooled oil, and debris, and very light to no oiling observed on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions. The shoreline clean-up activities within Segment 18.50 consisted of the following:

- Woody vegetation less than 2" in diameter removed
- Removal of oiled vegetation leaving roots intact up to 10' from waterline
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris
- Removal of overhanging vegetation

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Small amount of staining on the trees of right descending bank
- Stained trees in the river near end of Segment

Segment 18.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

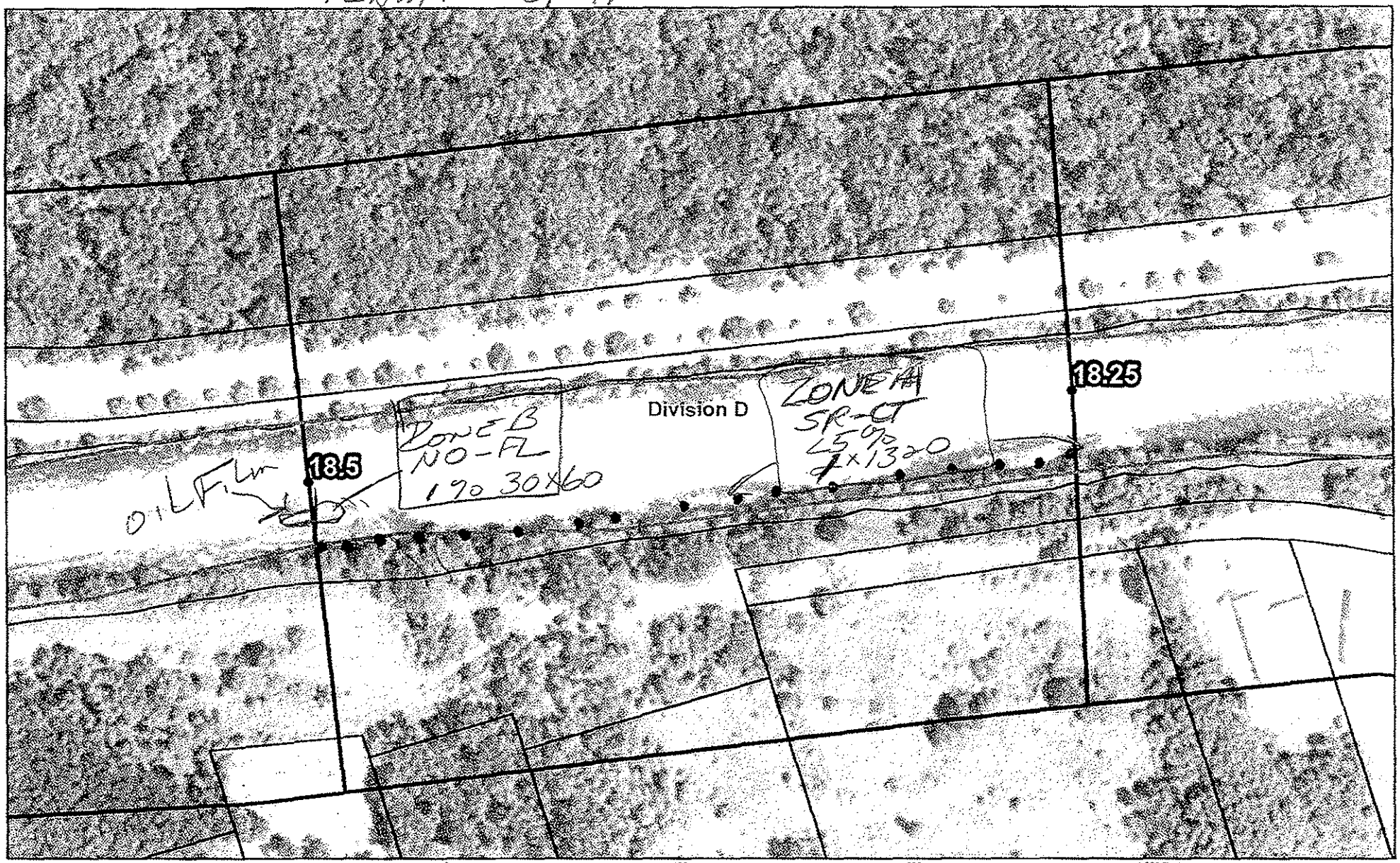
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 18.25-18.5 Left Bank While Looking Downstream										
SCD1-3	Shoreline	Shoreline Assessment	X		X	X	Oiled vegetation	Oil soaked trees, brush, and bank - cut vegetation and remove.	42.33625	-85.22685
SCD1-4	Shoreline	Shoreline Assessment	X	X	X	X	Pooled oil onto willow, stump, and leaves (10' x 15')	Remove pooled oil and cut vegetation	42.33605	-85.22642
SCD1-5	Shoreline	Shoreline Assessment	X		X	X	Oiled bank and bank vegetation	Thick heavily coated bank, trees, and branches. Dig out and remove, then assess.	42.33590	-85.22603
SCD1-6	Shoreline	Shoreline Assessment	X		X	X	Oiled bank and bank vegetation	Bank and bank vegetation coated - cut and/or chip and remove debris.	42.33582	-85.22517
SCD1-7	Shoreline	Shoreline Assessment	X		X	X	Oiled vegetation	Oil soaked hanging vegetation - cut and remove as debris.	42.33572	-85.22407
SCD1-8	Shoreline	Shoreline Assessment	X		X	X	Oiled vegetation	Thick oil soaking hanging vegetation. Cut and remove.	42.33565	-85.22357

ICAM1 8/29/10 v 10.2



QuarterMileMarkers
Parcels_1020ftBuffer
Shoreline
River_QuarterMiles
Divisions

18.25 to 18.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

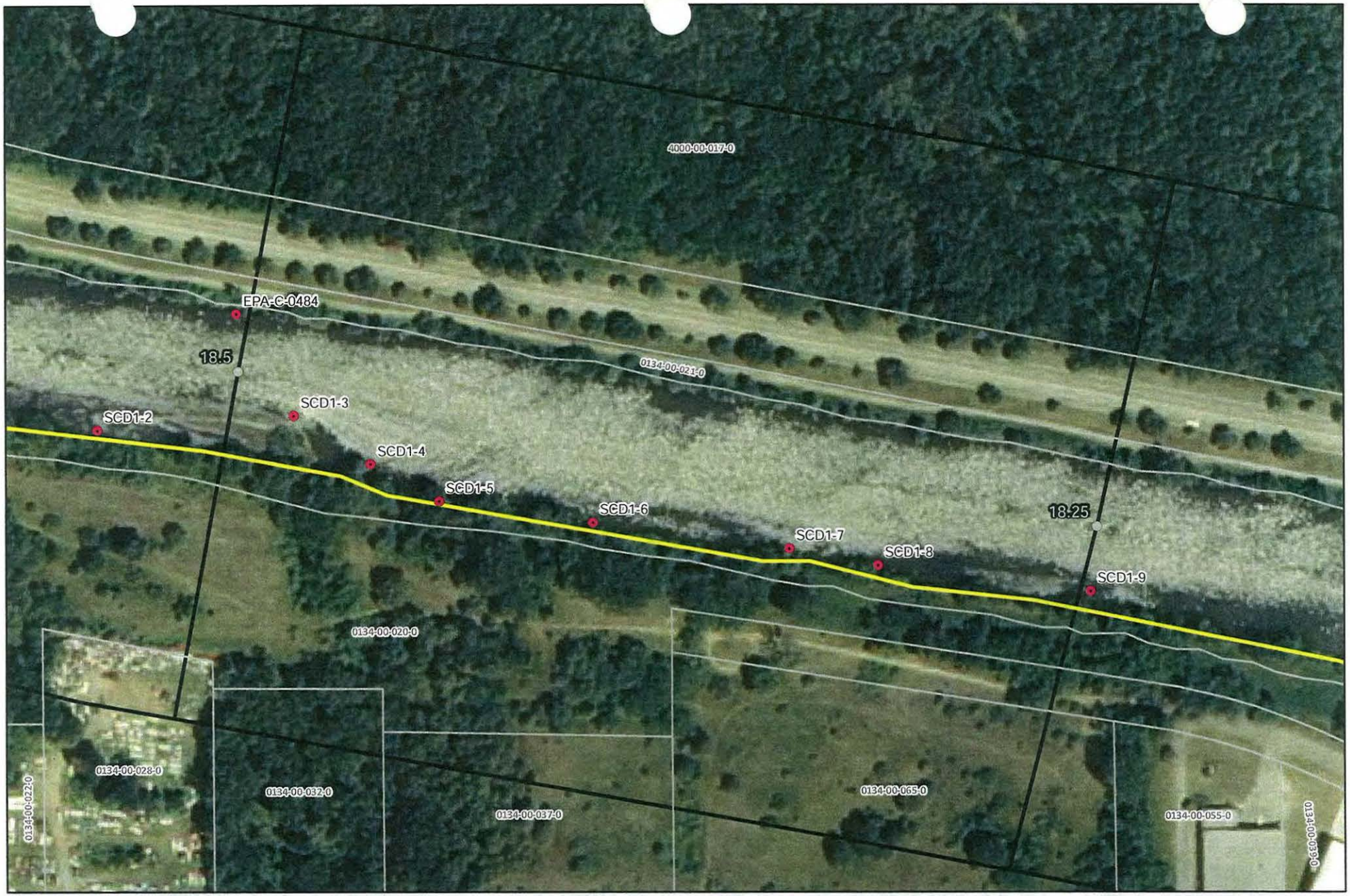
Image: 2009 NAIP

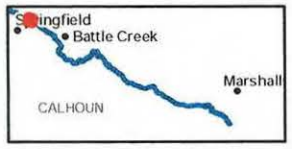
SHEET = 43

ENTRIX
Down to Earth, Down to Business

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 18.25-18.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

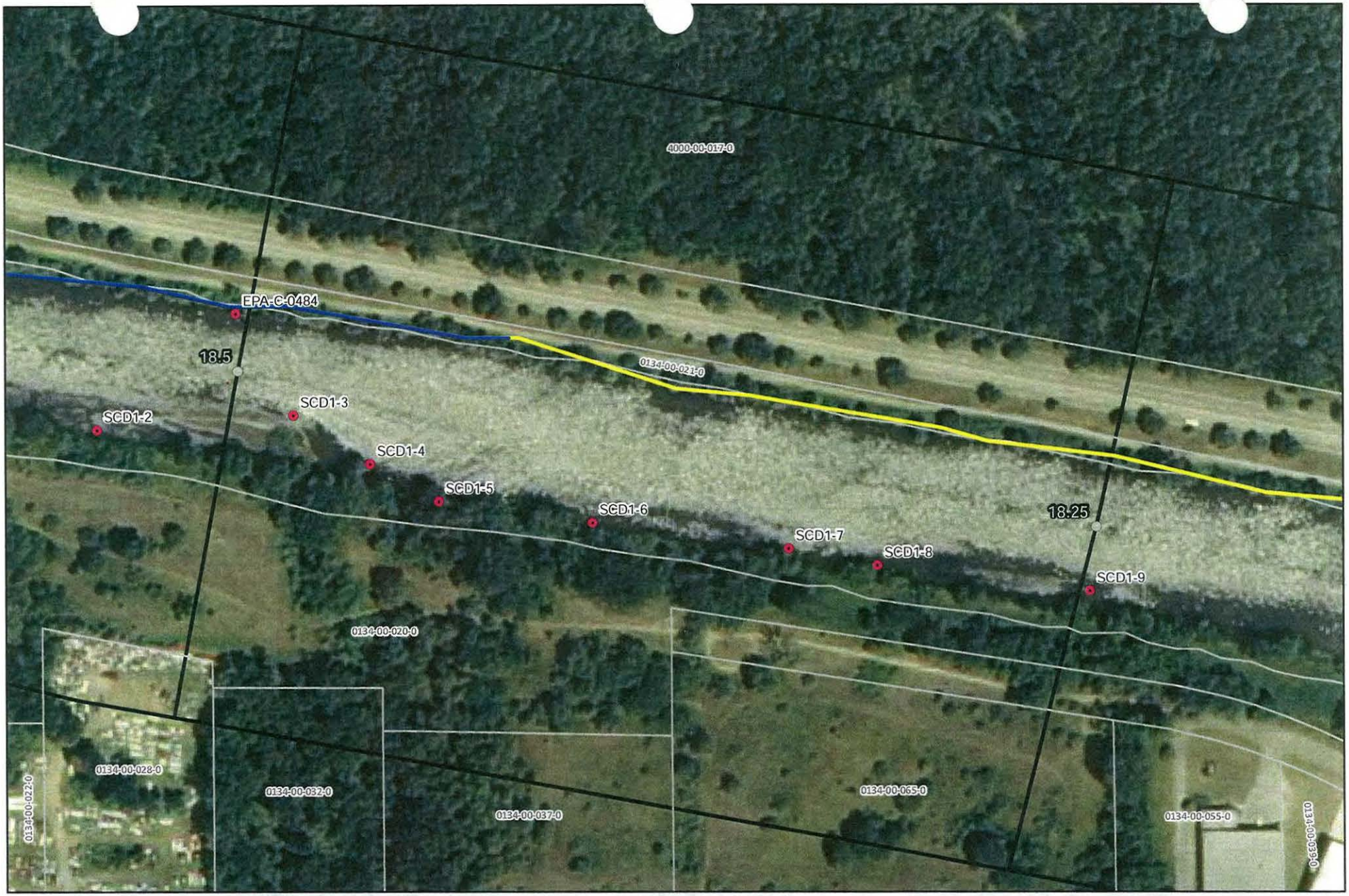
ENTRIX

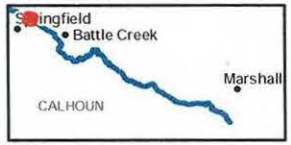
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 18.25-18.5 Right Bank While Looking Downstream										
EPA-C-0484	Channel	SCAT T2 08/29/2010	End of segment 18.5 Photo #574 Looking downstream from MP 18.25 Photo #575 Looking upstream of MP 18.50 Mousse on debris in slow moving areas. Cleanup efforts effective. Small amounts of staining on trees.					No further action required.	42.33668	-85.22718





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 18.25-18.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
CRAFT INSPECTION REPORT (CIR)

Date: 5-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 18.25 Start MP to End MP 18.50 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 80°F

Field Inspection Team

Enbridge Inspector: Doug Deren [signature] ENBRIDGE

Division Supervisor(Contractor): [signature] O'BRIEN'S 9-5-10

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

- All shore line assessments were completed by operations prior to inspection
- No hotshot operations req'd

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

- No overbank recommendations for this section.

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

- All shoreline assessments were completed prior to inspection
- No hotshot operations req'd.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

- No overbank recommendations for this section.

Revised9/01/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-5-10 **Time: AM** (PM)

Operations Division: D **Segment ID: From** 18.25 **Start MP to End MP** 18.5 **Segment Length: 0.25 mile**

Bank: (LDB) / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector: David Pesses

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 6 areas of concern according to the SCAT Report
Clean up required is Flushing, Washing, Veg. removal, and debris removal.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 6 areas of concern according to the SCAT report
Clean up is complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 18.25-18.5 Left Bank While Looking Downstream											
SCD1-7	Shoreline	Shoreline Assessment	X		X	X	Oiled vegetation	Oil soaked hanging vegetation - cut and remove as debris.	42.33572	-85.22407	Y / N
SCD1-8	Shoreline	Shoreline Assessment	X		X	X	Oiled vegetation	Thick oil soaking hanging vegetation. Cut and remove.	42.33565	-85.22357	Y / N

Print Inspector Name: Mike Van Loon, Stephen Ball, Brian Washburn

Date: 7/6/2010

Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 18.25-18.5 Left Bank While Looking Downstream											
SCD1-3	Shoreline	Shoreline Assessment	X		X	X	Oiled vegetation	Oil soaked trees, brush, and bank - cut vegetation and remove.	42.33625	-85.22685	(Y) / N
SCD1-4	Shoreline	Shoreline Assessment	X	X	X	X	Pooled oil onto willow, stump, and leaves (10' x 15')	Remove pooled oil and cut vegetation	42.33605	-85.22642	(Y) / N
SCD1-5	Shoreline	Shoreline Assessment	X		X	X	Oiled bank and bank vegetation	Thick heavily coated bank, trees, and branches. Dig out and remove, then assess.	42.33590	-85.22603	(Y) / N
SCD1-6	Shoreline	Shoreline Assessment	X		X	X	Oiled bank and bank vegetation	Bank and bank vegetation coated - cut and/or chip and remove debris.	42.33582	-85.22517	(Y) / N

9/6/2010

Mike Van Loan, Stephen Ball, Bruce Washburn

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 18.25-18.5 Right Bank While Looking Downstream											
EPA-C-0484	Channel	SCAT T2 08/29/2010	End of segment 18.5 Photo #574 Looking downstream from MP 18.25 Photo #575 Looking upstream of MP 18.50 Mousse on debris in slow moving areas. Cleanup efforts effective. Small amounts of staining on trees.					No further action required.	42.33668	-85.22718	(Y) / N

Print Inspector Name: Mike Van Loan, Stephen Bull, Bruce Washburn

Date: 9/16/2010

Comments:

LDB @ MP 18.5 heavily coated silver maple tree. ~ 2 feet up trunk.

No further action @ this time.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: D **Segment ID: From MP** 18.25 **to MP** 18.50 **Segment Length: 0.25 mile**

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature	(date)	
Ken Costley	05-Sept-2010	Enbridge
	9/5/10	EPA

4. **SCAT Reassessment**

Signature	(date)	
Michael Van Loan	9/6/10	Enbridge
Stephen Ball	9/6/10	EPA
Bruce Washburn	9/6/10	MDNRE

5. **EPA**

Signature	(date)	
GARY LIPSON	9/16/10	EPA Division Supervisor

Appendix E
Photos



Photo 0074 – Looking northwest at right descending bank.



Photo 0075 – Looking southwest at left descending bank. Near SCD1-8, SCD1-7.



Photo 0076 – Looking south at left descending bank. Near SCD1-8, SCD1-7.



Photo 0077 – Looking southwest at left descending bank. Near SCD1-6.



Photo 0078 – Looking south at left descending bank. Near SCD1-6.



Photo 0079 – Looking southwest at left descending bank. Near SCD1-5.



Photo 0080 – Looking south at left descending bank. Near SCD1-4.



Photo 0081 – Looking south at left descending bank. Near SCD1-3.



Photo 0082 – Looking northeast at right descending bank.



Photo 0083 – Looking southwest at Island. Near Zone B.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 18.75 – MP 18.50 to 18.75

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 18.75 had light oiling on the left descending bank, including overhanging oiled vegetation and no oiling on the right descending bank, except for some oiled overhanging vegetation and debris. A small amount of staining was also observed on the trees along the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

A snare was deployed along the shoreline to reduce sheen from the river and assist in field identification where free oil recovery operations had been conducted. The shoreline clean-up activities within Segment 18.75 consisted of the following:

- Woody vegetation less than 2" in diameter removed
- Removal of oiled vegetation leaving roots intact up to 10' from waterline
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris
- Removal of overhanging vegetation

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 18.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

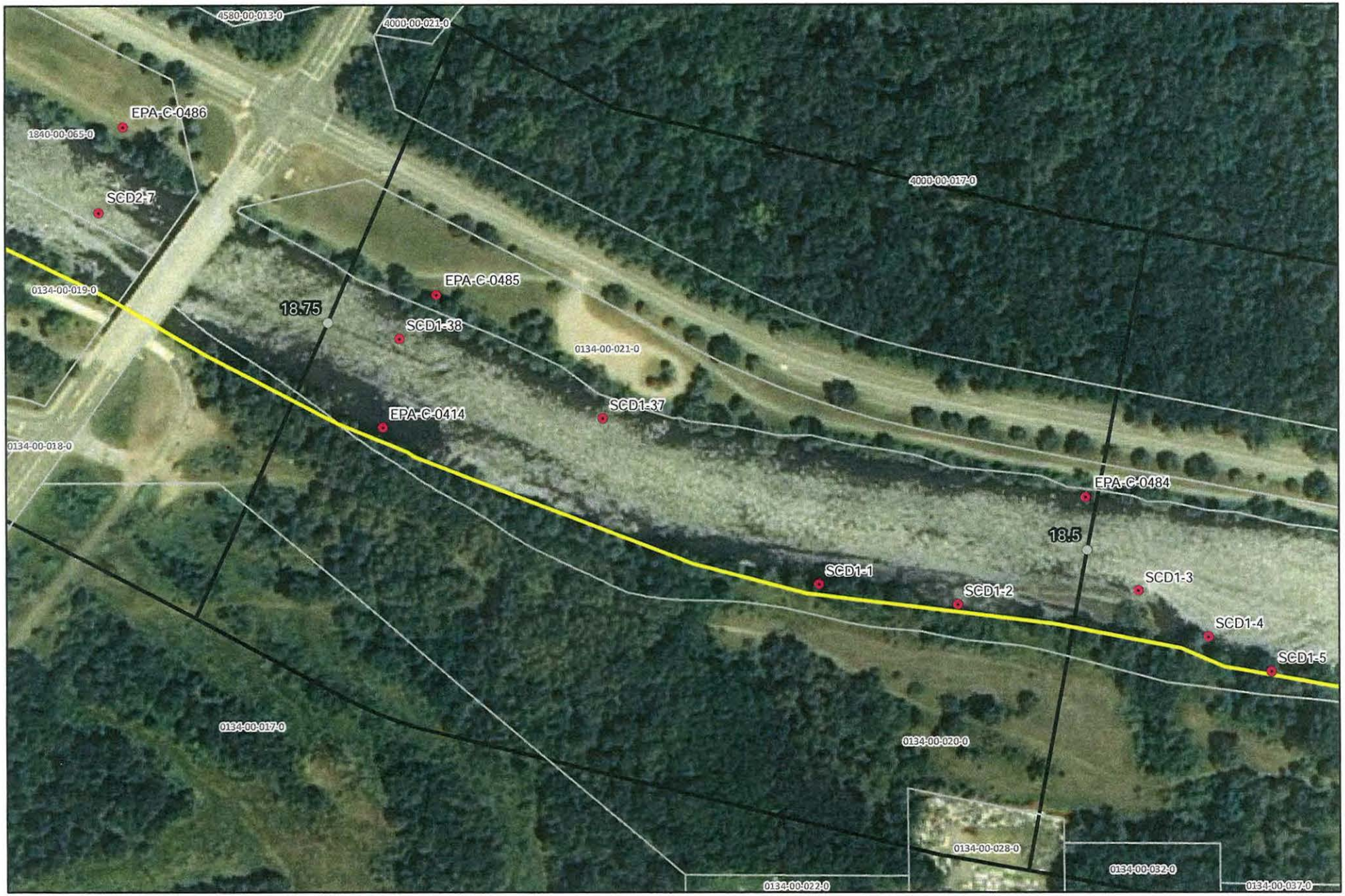
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

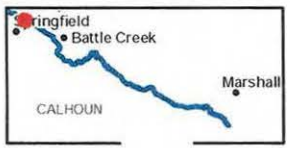
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In[illegible] - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 18.50-18.75 Left Bank While Looking Downstream										
SCD1-1	Shoreline	Shoreline Assessment	X		X		Overhanging tree is oiled - spotted on the trunk. Cut and remove vegetation and debris	Cut and remove vegetation and debris	42.33627	-85.22880
SCD1-2	Shoreline	Shoreline Assessment	X		X	X	Soaked bank, vegetation, tree, wood - cut, remove, and dispose.	Cut, remove, and dispose	42.33618	-85.22795
EPA-C-0414	Shoreline	SCAT T1 8/30/10	Some oil coralled by overhanging veg & debris ~100 yds upstream from boat launch. More oily sediments observed at mile post 18.5, may be able to stage from backshore--old field. Lots of oil film on water, also surveyed partially by foot.					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.33697	-85.23148





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 18.5-18.75
Left Bank While Looking Downstream

Enbridge *Release Incident - Kalamazoo River Oil Spill*

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

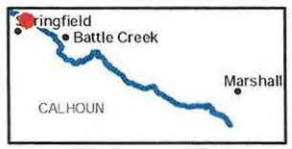
www.entrix.com

Coordinate System: NAD 1983 State Plane South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 18.50-18.75 Right Bank While Looking Downstream										
SCD1-37	Shoreline	Shoreline Assessment			X		Oiled overhang vegetation. Cut and remove. Snare deployed.	Cut and remove vegetation	42.33702	-85.23013
SCD1-38	Shoreline	Shoreline Assessment			X		Oiled overhang vegetation. Cut and remove. Snare deployed.	Cut and remove vegetation	42.33737	-85.23138
EPA-C-0414	Shoreline	SCAT T1 08/30/2010	Some oil coralled by overhanging veg & debris ~100 yds upstream from boat launch. More oily sediments observed at mile post 18.5. May be able to stage from backshore--old field. Lots of oil film on water.					Remove debris, cut back vegetation	42.33697	-85.23148
EPA-C-0485	Channel	SCAT T2 08/29/2010	Photo #576 Downstream of MP 18.50 Photo #577 Looking upstream from MP 18.75 Mousse on debris in slow moving areas. Cleanup efforts effective.. Small amounts of staining on trees. End of segment 18.75					No further action required	42.33757	-85.23116





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 18.5-18.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
CRAFT INSPECTION REPORT (CIR)

Date: 5-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 18.50 Start MP to End MP 18.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 80°F

Field Inspection Team

Enbridge Inspector: Doug Deeren ENBRIDGE

Division Supervisor(Contractor): OBRIENS 9-5-10

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

- All shoreline assessments were completed prior to inspection.
- No hot shot operations req'd

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

- No overbank recommendations for this section.

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

- All shoreline assessments were completed prior to inspection.
- No hotshot operations req'd

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

- No overbank recommendations for this section.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-5-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 18.5 **Start MP to End MP** 18.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector: David Pessos

Division Supervisor(Contractor): Steve O'Brien

SCAT Reviewed – Description of Clean Up Required

Reviewed 7 areas of concern according to the SCAT report.
Clean up required is flushing, veg. removal, and debris removal.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 7 areas of concern according to the SCAT report
Clean up is complete.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division D: Mile Marker 18.50-18.75 Left Bank While Looking Downstream										
SCD1-1	Shoreline	Shoreline Assessment	X		X		Overhanging tree is oiled - spotted on the trunk. Cut and remove vegetation and debris	42.33627	-85.22880	(Y) / N
SCD1-2	Shoreline	Shoreline Assessment	X		X	X	Soaked bank, vegetation, tree, wood - cut, remove, and dispose.	42.33618	-85.22795	(Y) / N
EPA-C-0414	Shoreline	SCAT T1 8/30/10	Some oil coralled by overhanging veg & debris ~100 yds upstream from boat launch. More oily sediments observed at mile post 18.5, may be able to stage from backshore--old field. Lots of oil film on water, also surveyed partially by foot. Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods					42.33697	-85.23148	(Y) / N

Printed Team Members Names: Mike Van Loan, Stephen Bell, Bruce Washburn

Date: 9/6/2010

Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

Division D: Mile Marker 18.50-18.75 Right Bank While Looking Downstream

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
SCD1-37	Shoreline	Shoreline Assessment			X		Oiled overhang vegetation. Cut and remove. Snare deployed.	Cut and remove vegetation	42.33702	-85.23013	(Y) / N
SCD1-38	Shoreline	Shoreline Assessment			X		Oiled overhang vegetation. Cut and remove. Snare deployed.	Cut and remove vegetation	42.33737	-85.23138	(Y) / N
EPA-C-0414	Shoreline	SCAT T1 08/30/2010	Some oil coralled by overhanging veg & debris ~100 yds upstream from boat launch. More oily sediments observed at mile post 18.5. May be able to stage from backshore--old field. Lots of oil film on water. also surveyed partially by foot.					Remove debris, cut back vegetation	42.33697	-85.23148	(Y) / N
EPA-C-0485	Channel	SCAT T2 08/29/2010	Photo #576 Downstream of MP 18.50 Photo #577 Looking upstream from MP 18.75 Mousse on debris in slow moving areas. Cleanup efforts effective.. Small amounts of staining on trees. End of segment 18.75					No further action required	42.33757	-85.23116	(Y) N

Print Inspector Name: Mike Van Loan, Stephen Ball, Bruce Washburn

Date: 9/6/2010

Comments:

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: D **Segment ID: From MP** 18.50 **to MP** 18.75 **Segment Length: 0.25 mile**

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**



Signature Ken Cobley (date) 05-Sept-2010 Enbridge

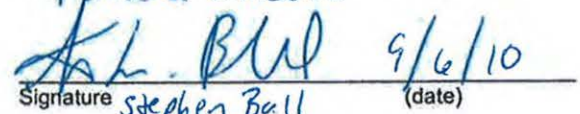


Signature (date) 9/5/10 EPA

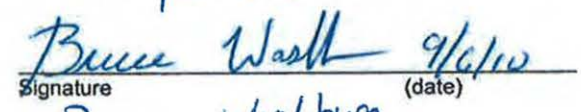
4. **SCAT Reassessment**



Signature Michael VanLoan (date) 9/6/2010 Enbridge

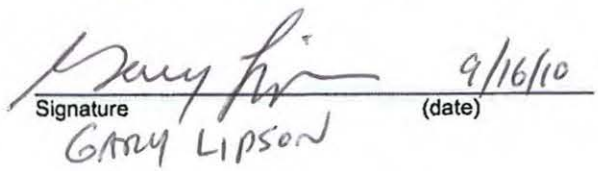


Signature Stephen Ball (date) 9/6/10 EPA



Signature Bruce Washburn (date) 9/6/10 MDNRE

5. **EPA**



Signature Gary Lipson (date) 9/16/10 EPA Division Supervisor

Appendix E
Photos



Photo 0084 – Looking south at left descending bank. Near SCD1-2.



Photo 0085 – Looking south at left descending bank. Near SCD1-1.



Photo 0086 – Looking south at left descending bank. Near EPA-C-0414.



Photo 0087 – Looking north at right descending bank. Near SCD1-38



Photo 0088 – Looking north at right descending bank. Near SCD1-37.



Photo 0089 – Looking northeast at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 19.00 – MP 18.75 to 19.00

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 19.00 had light oiling including oiling on overhanging vegetation on the left descending bank and oiled overhanging vegetation next to the bridge on the right descending bank. The overbank contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 19.00 consisted of the following:

- Removal of woody vegetation less than 2” in diameter
- Removal of oiled vegetation leaving roots intact
- Removal of overhanging limbs
- Removal of oiled debris

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions on shore were observed. Segment 19.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

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      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

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  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

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  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

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Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
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T	Trace	<1%		

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PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
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CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

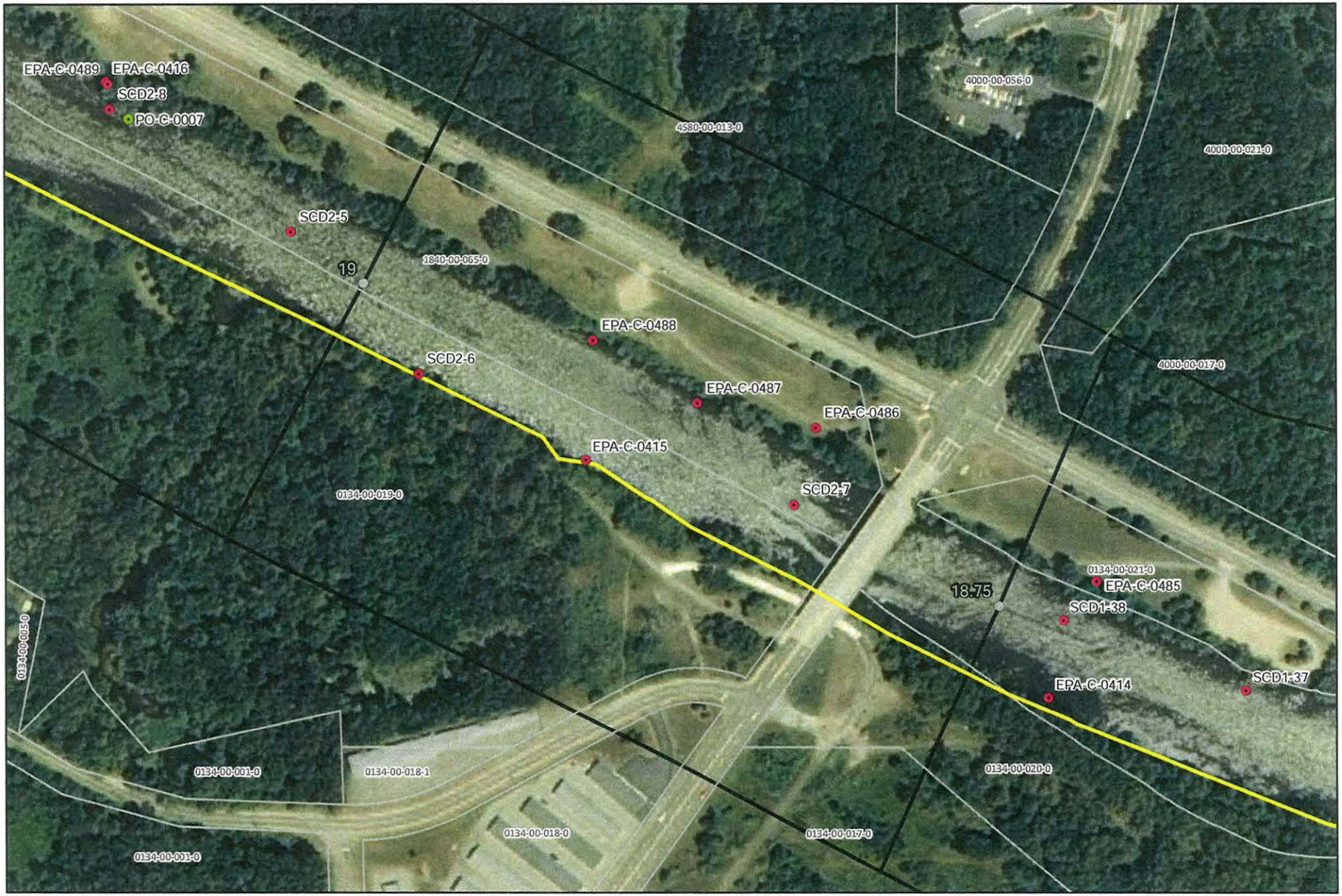
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

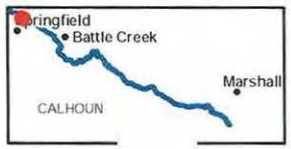
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In[illegible] - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 18.75-19.0 Left Bank While Looking Downstream										
EPA-C-0415	Shoreline	SCAT T1 8/30/10	Sparse overhanging oiled vegetation, also survey by foot					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.33815	-85.23467
SCD2-6	Shoreline	Shoreline Assessment			X		Oiled overhanging tree vegetation	Trim and remove vegetation.	42.33858	-85.23582





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 18.75-19
Left Bank While Looking Downstream

Enbridge *Release Incident - Kalamazoo River Oil Spill*

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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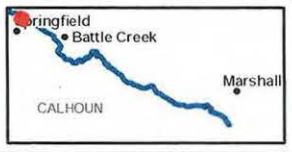
Ce em: NAD 1983 State
Pl South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 18.75-19.0 Right Bank While Looking Downstream										
EPA-C-0486	Shoreline	SCAT T2 08/29/2010	Photo # 579. Downstream from MP 18.75 Photo #580 Riprap w/sheen in water					Saturated pompoms along shoreline. Replace. Film on water in riprap under Bedford (M-37). Place pompom.	42.33832	-85.23309
EPA-C-0487	Shoreline	SCAT T2 08/29/2010						Debris in boom needs removal. Remove debris behind boom.	42.33844	-85.23390
EPA-C-0488	Channel	SCAT T2 08/29/2010	End of segment 19.0 Photo #581 Looking upstream of MP 19.0 Clean up efforts effective.					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.33876	-85.23462
SCD2-7	Shoreline	Shoreline Assessment			X	X	Oiled overhanging vegetation next to bridge	Oiled overhanging vegetation next to bridge. Cut and remove debris.	42.33793	-85.23323





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 18.75-19
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

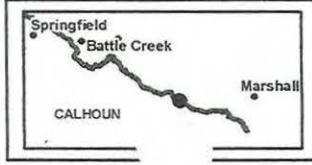
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division C: Mile Marker 5.75 - 6.0
Left Bank While Looking Downstream

Enbridge *Release Incident - Kalamazoo River Oil Spill*

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

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Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 4-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 18.75 Start MP to End MP 19.0 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 71°F

Field Inspection Team

Enbridge Inspector: Dave Dekker.

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT points marked green.
↳ after follow up on EPA-C-0415

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All SCAT points marked green
↳ after follow up on EPA-C-0486.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-9-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 18.75 **Start MP to End MP** 19.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 6 areas of concern from the SCAT report.
Clean up required is, Vegetation + debris removed and other hangers limbs removed.

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Inspected both LDB + RDB and all clean up is complete according to the SCAT recommendations.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 18.75-19.0 Left Bank While Looking Downstream										
EPA-C-0415	Shoreline	SCAT T1 8/30/10	Sparse overhanging oiled vegetation, also survey by foot					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.33815	-85.23467
SCD2-6	Shoreline	Shoreline Assessment			X		Oiled overhanging tree vegetation	Trim and remove vegetation.	42.33858	-85.23582

James Sollee, MDNRE
Rose del Rosario, USEPA
Amanda Bohnenblust

Team 4 9/11/10

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 18.75-19.0 Right Bank While Looking Downstream										
EPA-C-0486	Shoreline	SCAT T2 08/29/2010	Photo # 579. Downstream from MP 18.75 Photo #580 Riprap w/sheen in water					Saturated pompoms along shoreline. Replace. Film on water in riprap under Bedford (M-37). Place pompom.	42.33832	-85.23309 (Y)
EPA-C-0487	Shoreline	SCAT T2 08/29/2010						Debris in boom needs removal. Remove debris behind boom.	42.33844	-85.23390 (Y)
EPA-C-0488	Channel	SCAT T2 08/29/2010	End of segment 19.0 Photo #581 Looking upstream of MP 19.0 Clean up efforts effective. - not a zone					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.33876	-85.23462 (Y)
SCD2-7	Shoreline	Shoreline Assessment			X	X	Oiled overhanging vegetation next to bridge	Oiled overhanging vegetation next to bridge. Cut and remove debris.	42.33793	-85.23323 (Y)

→ observed sheen. no pompoms present

Team 4 9/11/10
James Saller, MDNRE
Ross Del Rosario, USEPA
Amanda Bohnenblust

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 18.75 to MP 19.00 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley 10-Sept-2010 (date) Enbridge

Signature Eduardo Rovira 9/10/10 (date) EPA

Eduardo Rovira

4. **SCAT Reassessment**

Signature Amanda Bohnenblust 9/11/10 (date) Enbridge

Signature ROSS DELROSARIO 9-11-10 (date) EPA

Signature James Sollee 9-11-10 (date) MDNRE

5. **EPA**

Signature GARY LIPSON 9/16/10 (date) EPA Division Supervisor

Appendix E
Photos



Photo 0293 – Looking north at right descending bank. Near SCD2-7 & EPA-C-0486.



Photo 0294 – Looking northeast at right descending bank.



Photo 0295 – Looking southwest at left descending bank. Near EPA-C-0415.



Photo 0296 – Looking southwest at left descending bank. Near SCD2-6.



Photo 0297 – Looking east at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 19.25 – MP 19.00 to 19.25

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 19.25 had light levels of oiling on the left descending bank, including subsurface tar balls, and no oiling observed on the right descending bank, except for some oiled overhanging vegetation. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

In addition to the clean-up actions listed below, anchored snare booms to capture subsurface tar balls along the left descending bank were deployed. Pooled oil was removed during SCAT reassessment. The shoreline clean-up activities within Segment 19.25 consisted of the following:

- Removal of overhanging vegetation
- Pooled oil removal
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Trace staining of trees along the right descending bank.
- Trace staining of trees along the left descending bank.

Segment 19.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
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Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

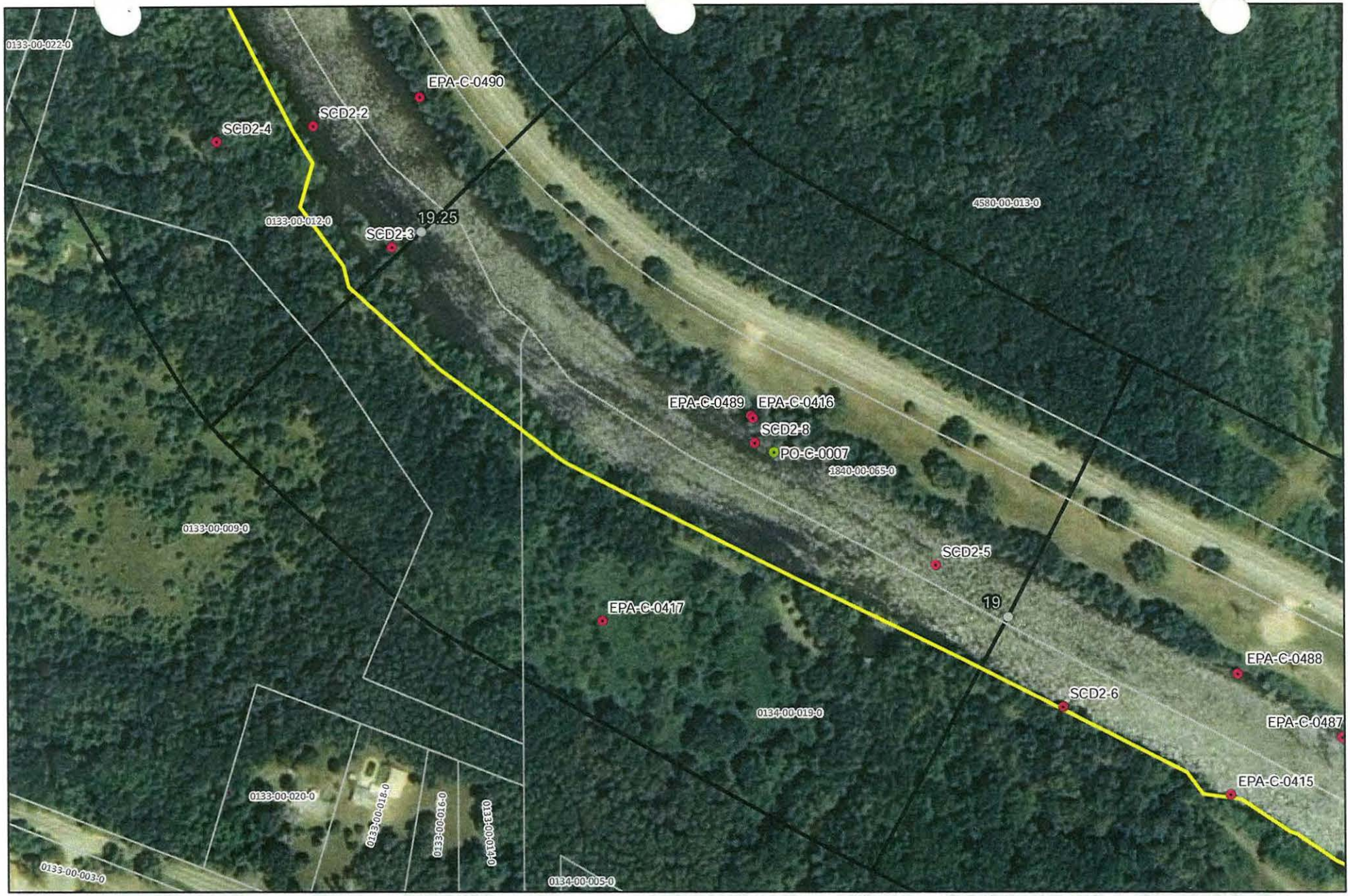
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 19.0-19.25 Left Bank While Looking Downstream										
SCD2-5	Shoreline	Shoreline Assessment	X				Note: General river & channel now observed to have subsurface tar balls (verified by Robert Raymond).	Recommendation - deploy anchored snare booms to capture subsurface tar balls.	42.33930	-85.23670
EPA-C-0416	Shoreline	SCAT T1 8/30/10	A very light sheen was observed at mouth of creek on exposed sand; nothing up the creek, also surveyed by foot. Creek channel at bike path bridge surveyed--no oil observed.					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.34006	-85.23798
EPA-C-0417	Shoreline	SCAT T1 8/30/10	gps at mile post marked 19.25; approximate start of island, also surveyed by foot					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.33900	-85.23900





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 19-19.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

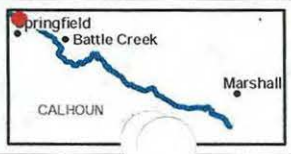
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 19.0-19.25 Right Bank While Looking Downstream										
EPA-C-0489	Shoreline	SCAT T2 08/29/2010	End of Segment 19.25 Photo # 582 looking downstream of MP 19.0. Photo # 583 looking upstream of MP 19.25 Trace staining. Mousse in the water at logjams; MP 19.25 incorrectly marked as 19.50 RDB					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.34004	-85.23797
SCD2-8	Shoreline	Shoreline Assessment			X		Overhanging vegetation	Overhanging vegetation. Cut and remove.	42.33992	-85.23795





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 19-19.25
Right Bank While Looking Downstream

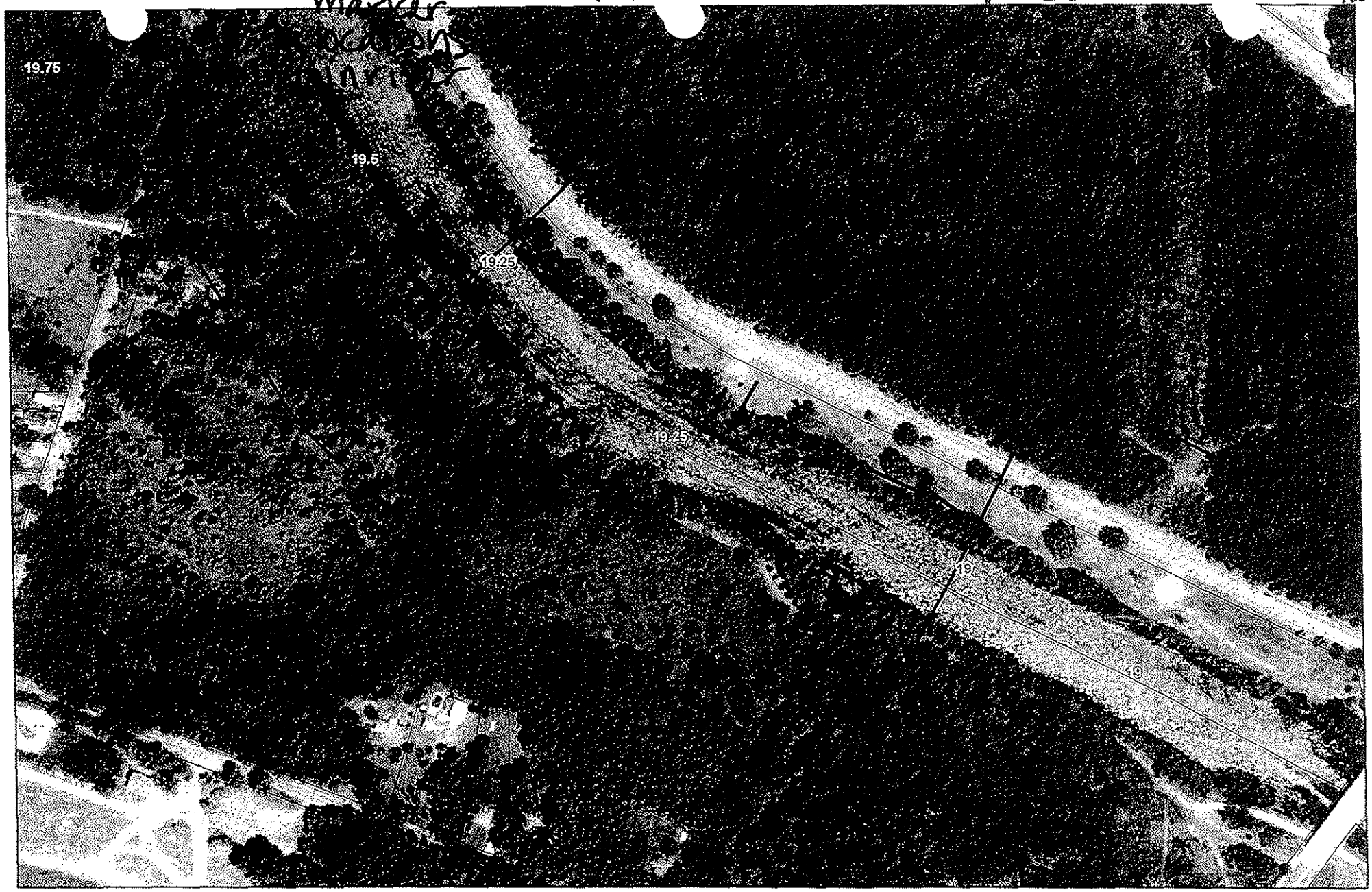
Enbridge [illegible] Release Incident - Kalamazoo River Oil Spill

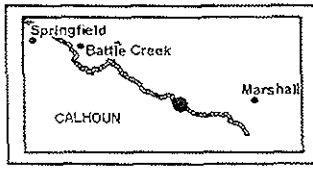
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Co[illegible]tem: NAD 1983 State Pl[illegible] South Feet





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division C: Mile Marker 5.75 - 6.0
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
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Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
CRAFT INSPECTION REPORT (CIR)

Date: 6-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 19.00 Start MP to End MP 19.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 72°F

Field Inspection Team

Enbridge Inspector: BLR - 6-Sept-10 Doug Deken

Division Supervisor(Contractor): STEVE TURNER - 9-6-10

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

→ EPA-C-0416 marked incorrectly on the map

→ All other ID points identified

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

EPA-C-0417 & EPA-C-0417 → I walked deep into the bush + could not find any point around the given GPS coordinates.

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

~ No overbank recommendations req'd to inspect.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-6-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 19.0 **Start MP to End MP** 19.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Cloud

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 4 areas according to the SCAT report.
Clean up required Flushing, Veg. removal and Shore clean up.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 4 areas according to the SCAT report
All ~~need~~ clean up is complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 19.0-19.25 Left Bank While Looking Downstream											
SCD2-5	Shoreline	Shoreline Assessment	X				Note: General river & channel now observed to have subsurface tar balls (verified by Robert Raymond).	Recommendation - deploy anchored snare booms to capture subsurface tar balls.	42.33930	-85.23670	(Y) / N
EPA-C-0416	Shoreline	SCAT T1 8/30/10	A very light sheen was observed at mouth of creek on exposed sand; nothing up the creek, also surveyed by foot. Creek channel at bike path bridge surveyed--no oil observed.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.34006	-85.23798	(Y) / N
EPA-C-0417	Shoreline	SCAT T1 8/30/10	gps at mile post marked 19.25; approximate start of island, also surveyed by foot					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.33900	-85.23900	(Y) / N

Printed Team Members Names: Jack Boss, Bill Bates, James Sallee
Date: 9/8/10
Comments: WP: 004 N42.33892, W-85.23695; sheening still present at creek

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 19.0-19.25 Right Bank While Looking Downstream											
EPA-C-0489	Shoreline	SCAT T2 08/29/2010	End of Segment 19.25 Photo # 582 looking downstream of MP 19.0. Photo # 583 looking upstream of MP 19.25 Trace staining. Mousse in the water at logjams; MP 19.25 incorrectly marked as 19.50 RDB					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.34004	-85.23797	(Y) / N
SCD2-8	Shoreline	Shoreline Assessment			X		Overhanging vegetation	Overhanging vegetation. Cut and remove.	42.33992	-85.23795	(Y) / N

Printed Team Members Names: Jack Bost, Bill Bates, James Sallee
Date: 9/8/10
Comments:

PO-C-0007	Pooled Oil	Pooled oil should be removed	Pool Oil Removal	42.33987	-85.23782	(Y) N

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 19.00 to MP 19.25 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley 07-Sept-2010 (date) Enbridge

Signature Stephen Ball 9/7/10 (date) EPA

4. **SCAT Reassessment**

Signature Jack W. Boss 9/8/10 (date) Enbridge

Signature William J Bates 9/8/10 (date) EPA

Signature James Sallee 9/8/10 (date) MDNRE

5. **EPA**

Signature GARY LIDSON 9/16/10 (date) EPA Division Supervisor

Appendix E
Photos



Photo 0090 – Looking northwest at right descending bank.



Photo 0091 – Looking north at right descending bank. Near SCD2-8.



Photo 0092 – Looking north at right descending bank. Near EPA-C-0489.



Photo 0093 – Looking northwest at right descending bank.



Photo 0094 – Looking southeast at left descending bank.



Photo 0095 – Looking southwest at left descending bank.



Photo 0096 – Looking south at island left descending bank. Near EPA-C-0417.



Photo 0097 – Looking southwest at island left descending bank Overbank. Near EPA-C-0417.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 19.50 – MP 19.25 to 19.50

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 19.50 had light levels of oiling on the left descending bank, including oiled vegetation and debris. No oiling was observed on the right descending bank, except for a small area of oiled soil. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within segment 19.50 consisted of the following

- Woody vegetation less than 2” in diameter removed
- Removal of oiled vegetation leaving roots intact up to 10’ from waterline
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Some oiled soil remains in place on the left descending bank behind near SCD2-2 and SCD-4
- Oiled woody vegetation on right descending bank near MP 19.50

Segment 19.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Response Completion Report
Kalamazoo River Segment 20.00 – MP 19.75 to 20.00

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the response completion report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 20.00 had very light levels of oiling on the left descending bank and no oil observed on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

Light oil was present on the left bank and no oil on the right bank. As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Cleanup Recommendations Method. There were no problematic areas that required special considerations.

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Very light oil on the left descending bank.

Segment 20.00 has reached the operational endpoints pursuant to EPA's Clean Water Act. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 19.25-19.5 Left Bank While Looking Downstream										
SCD2-2	Shoreline	Shoreline Assessment	X		X	X	Oiled hanging leaves at low shoreline bank elevation. Some oil observed behind bank (2 ft. up). Recommend trim overhanging veg. Recommend natural attenuation or make further assessment behind bank.	Trim overhanging vegetation. Recommend natural attenuation or make further assessment behind bank.	42.34153	-85.24102
SCD2-3	Shoreline	Shoreline Assessment	X			X	Oil jammed debris. Collect and remove debris. Note beavers observed in area.	Collect and remove debris.	42.34092	-85.24047
SCD2-4	Shoreline	Shoreline Assessment	X				Low depression behind bank. Very lightly oiled water.	Further assessment recommended	42.34145	-85.24168



Division C: Mile Marker 19.25-19.5
Left Bank While Looking Downstream

Enbridge *Release Incident - Kalamazoo River Oil Spill*

Source: Aerial Photography: USDA, 2009.

ENTRIX

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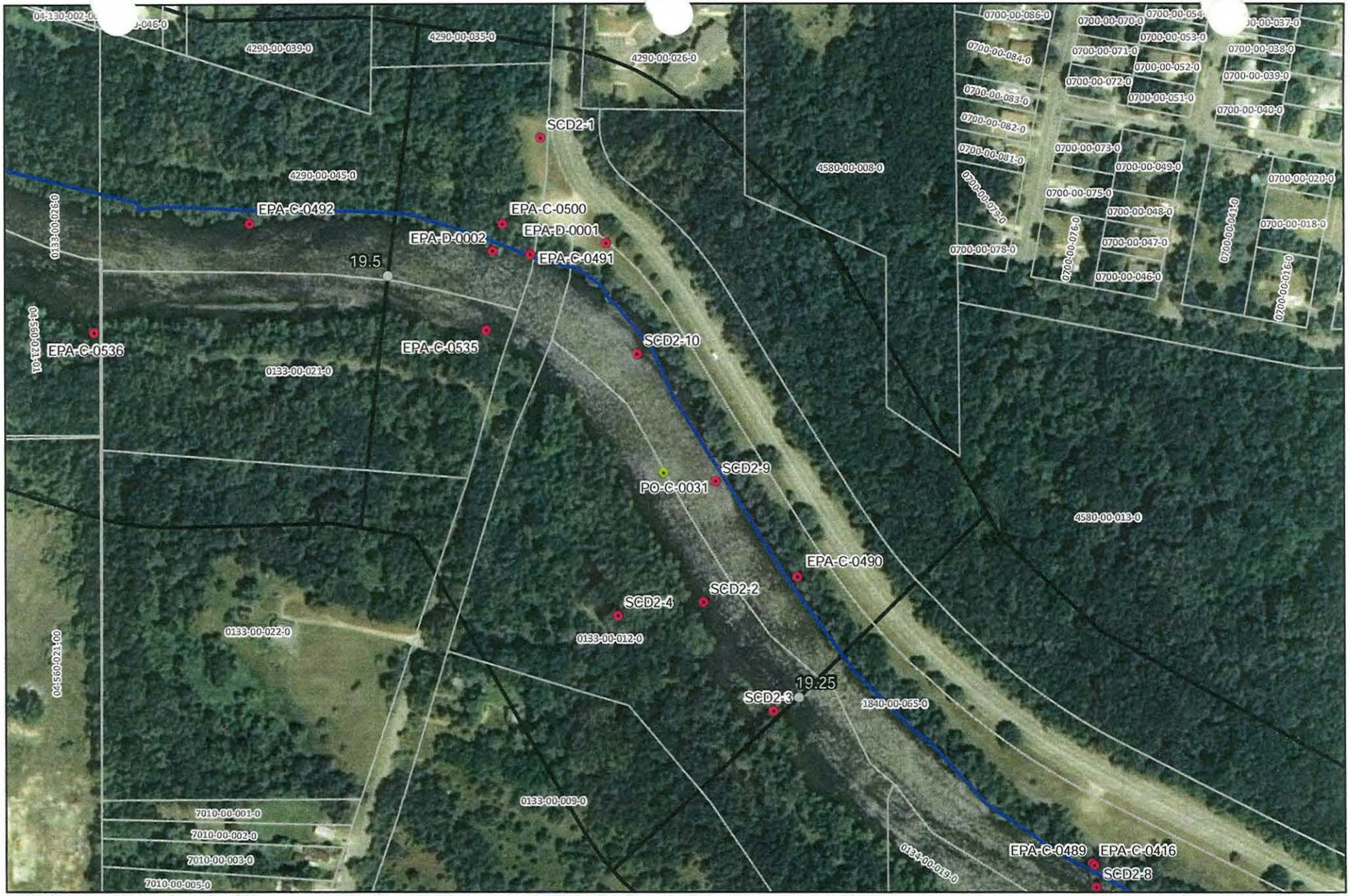
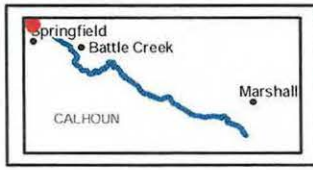
Coordinate System: NAD 1983 State Plane South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 19.25-19.5 Right Bank While Looking Downstream										
SCD2-9	Shoreline	Shoreline Assessment			X		Oiled vegetation overhanging	Oiled vegetation overhanging. Cut and remove.	42.34223	-85.24093
SCD2-10	Shoreline	Shoreline Assessment			X		Oiled vegetation overhanging	Oiled vegetation overhanging. Cut and remove.	42.34297	-85.24155
EPA-C-0492	Shoreline	SCAT T2 08/29/2010	End of 19.50? Map shows 19.50, sign says 20.0 Photo # 584 looking downstream from milepost 19.5 (should this mile marker actually be 19.25?) Photo # 586 Looking upstream from 19.50? this photo actually taken from milemarker 20.0					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.34370	-85.24458
EPA-C-0490	Shoreline	SCAT T2 08/29/2010	Sign labeled as MP 19.75. Is this correct? Removed oiled vegetation leaving roots					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.34168	-85.24029
EPA-C-0491	Shoreline	SCAT T2 08/29/2010	Remove oiled soil with flat shovel					Remove oiled soil with flat shovel	42.34353	-85.24239





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 19.25-19.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

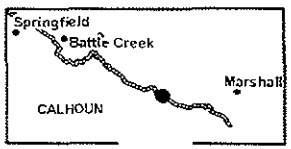
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

problems with milemarker locations 19.50 Team L 8/29/10





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division C: Mile Marker 5.75 - 6.0
Left Bank While Looking Downstream

Enbridge — Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Co
Pl
stem: NAD 1983 State
South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
CRAFT INSPECTION REPORT (CIR)

Date: 6-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 19.25 Start MP to End MP 19.50 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 71°F

Field Inspection Team

Enbridge Inspector: BLRL - Doug Deren 6-Sept-10

Division Supervisor(Contractor): Steve Turner 9-6-10

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

→ No clean-up req'd on recommended points.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

SC02-4 was checked + found to be very little to know sheen.

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

→ No clean-up req'd on recommended points

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No points identified on the 1st. (shown on the map though).

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-6-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 19.25 **Start MP to End MP** 19.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Cloud

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 5 areas of concern according to the SCAT report
Clean up required flushing, veg. & debris removal.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 5 areas of concern according to the SCAT report.
SCAT Requirements have been met and Clean up is complete.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 19.25-19.5 Left Bank While Looking Downstream											
SCD2-2	Shoreline	Shoreline Assessment	X		X	X	Oiled hanging leaves at low shoreline bank elevation. Some oil observed behind bank (2 ft. up). Recommend trim overhanging veg. Recommend natural attenuation or make further assessment behind bank.	Trim overhanging vegetation. Recommend natural attenuation or make further assessment behind bank.	42.34153	-85.24102	Y / N
SCD2-3	Shoreline	Shoreline Assessment	X			X	Oil jammed debris. Collect and remove debris. Note beavers observed in area.	Collect and remove debris.	42.34092	-85.24047	Y / N
SCD2-4	Shoreline	Shoreline Assessment	X				Low depression behind bank. Very lightly oiled water.	Further assessment recommended	42.34145	-85.24168	Y / N

Printed Team Members Names: BILL BATES Jack Boss James Sallee
Date: 9/8/10
Comments:

SCD2-1 Shoreline Shoreline Assessment No Comment No Recommendation 42.344217 -85.242317 Y / N
PO-C-0031 Pooled Oil Pooled Oil Recommended Pooled Oil Removal 42.34228 -85.24134 Y /N

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 19.25-19.5 Right Bank While Looking Downstream											
SCD2-9	Shoreline	Shoreline Assessment			X		Oiled vegetation overhanging	Oiled vegetation overhanging. Cut and remove.	42.34223	-85.24093	Y / N
SCD2-10	Shoreline	Shoreline Assessment			X		Oiled vegetation overhanging	Oiled vegetation overhanging. Cut and remove.	42.34297	-85.24155	Y / N
EPA-C-0492	Shoreline	SCAT T2 08/29/2010	End of 19.50? Map shows 19.50, sign says 20.0 Photo # 584 looking downstream from milepost 19.5 (should this mile marker actually be 19.25?) Photo # 586 Looking upstream from 19.50? this photo actually taken from milemarker 20.0					No Further Action Required	42.34370	-85.24458	Y / N
EPA-C-0490	Shoreline	SCAT T2 08/29/2010	Sign labeled as MP 19.75. Is this correct? Removed oiled vegetation leaving roots					Remove oiled vegetation, leave roots	42.34168	-85.24029	Y / N
EPA-C-0491	Shoreline	SCAT T2 08/29/2010	Remove oiled soil with flat shovel					Remove oiled soil with flat shovel	42.34353	-85.24239	Y / N

Printed Team Members Names: Bill Bates Jack Boss James Sallee
Date: 9/6/10
Comments:

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 19.25 to MP 19.50 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature	(date)	
Ken Lostley	07-Sept-2010	Enbridge
Stephen Ball	9/07/10	EPA

4. **SCAT Reassessment**

Signature	(date)	
Jack W. Bass	9/8/10	Enbridge
WILLIAM J BATES	9/8/10	EPA
James Saller	9/8/10	MDNRE

5. **EPA**

Signature	(date)	
GARY LIPSON	9/16/10	EPA Division Supervisor

Appendix E
Photos



Photo 0099 – Looking southwest at left descending bank. Near SCD2-3



Photo 0100 – Looking southwest at left descending bank. Near SCD2-4.

Field Photo Log – Segment MP 19.50



Photo 0101 – Looking south at left descending bank. Near SCD2-3.



Photo 0102 – Looking northeast at right descending bank. Near EPA-C-0490.



Photo 0103 – Looking northeast at right descending bank. Near SCD2-9.



Photo 0104 – Looking northeast at right descending bank. Near SCD2-10.



Photo 0105 – Looking north at right descending bank. Near EPA-C-0491.



Photo 0106 – Looking northwest at right descending bank. Near EPA-C-0500.



Photo 0107 – Looking east at left descending bank. Near EPA-C-0535.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 19.75 – MP 19.50 to 19.75

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 19.75 had very light oiling on the left descending bank including tar balls; and no oiling on the right descending bank. The overbank areas contained no oiling requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Very lightly oiled soil on the left descending bank
- Stained trees and tar balls on the left descending bank near EPA-C-0536

Segment 19.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 19.5-19.75 Left Bank While Looking Downstream										
EPA-C-0536	Shoreline	T4 8/29/2010					oil sheen and tar balls	Natural Attenuation	42.34306	-85.24578





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 19.5-19.75
Left Bank While Looking Downstream

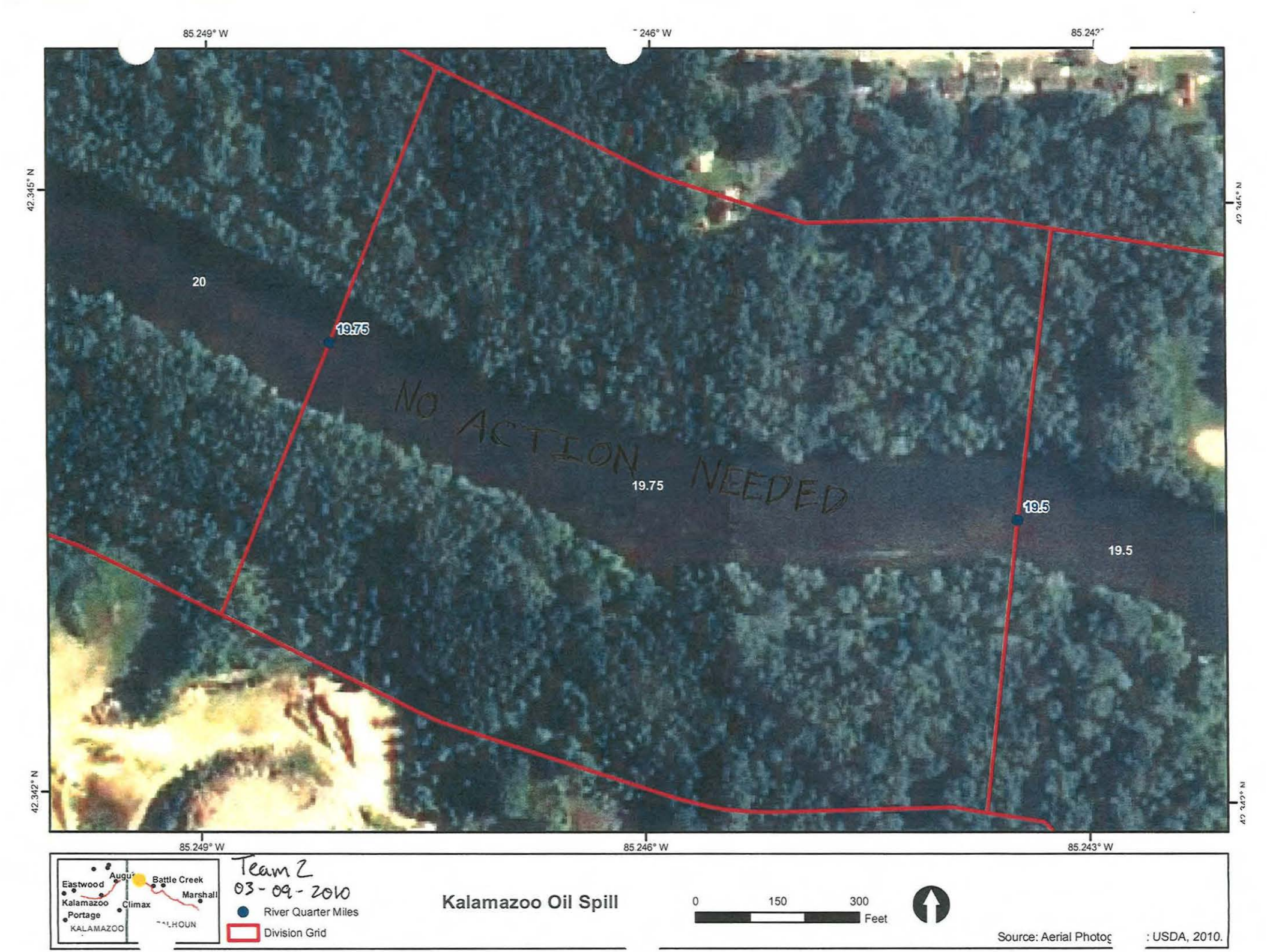
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet


85.249° W
85.246° W
85.243° W
42.345° N
42.342° N
20
19.75
19.75
19.5
19.5
NO ACTION NEEDED
Eastwood
Augusta
Battle Creek
Kalamazoo
Climax
Marshall
Portage
KALAMAZOO
CALHOUN
Team 2
03-09-2010
River Quarter Miles
Division Grid
Kalamazoo Oil Spill
0
150
300
Feet
Source: Aerial Photog
: USDA, 2010.

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 19.5-19.75 Right Bank While Looking Downstream										
EPA-C-0492	Shoreline	SCAT T2 8/29/2010					End of 19.50? Map shows 19.50, sign says 20.0 Photo # 584 looking downstream from milepost 19.5 (should this mile marker actually be 19.25?) Photo # 586 Looking upstream from 19.50? this photo actually taken from milemarker 20.0	No Further Action Required	42.343698	-85.24458





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 19.5-19.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

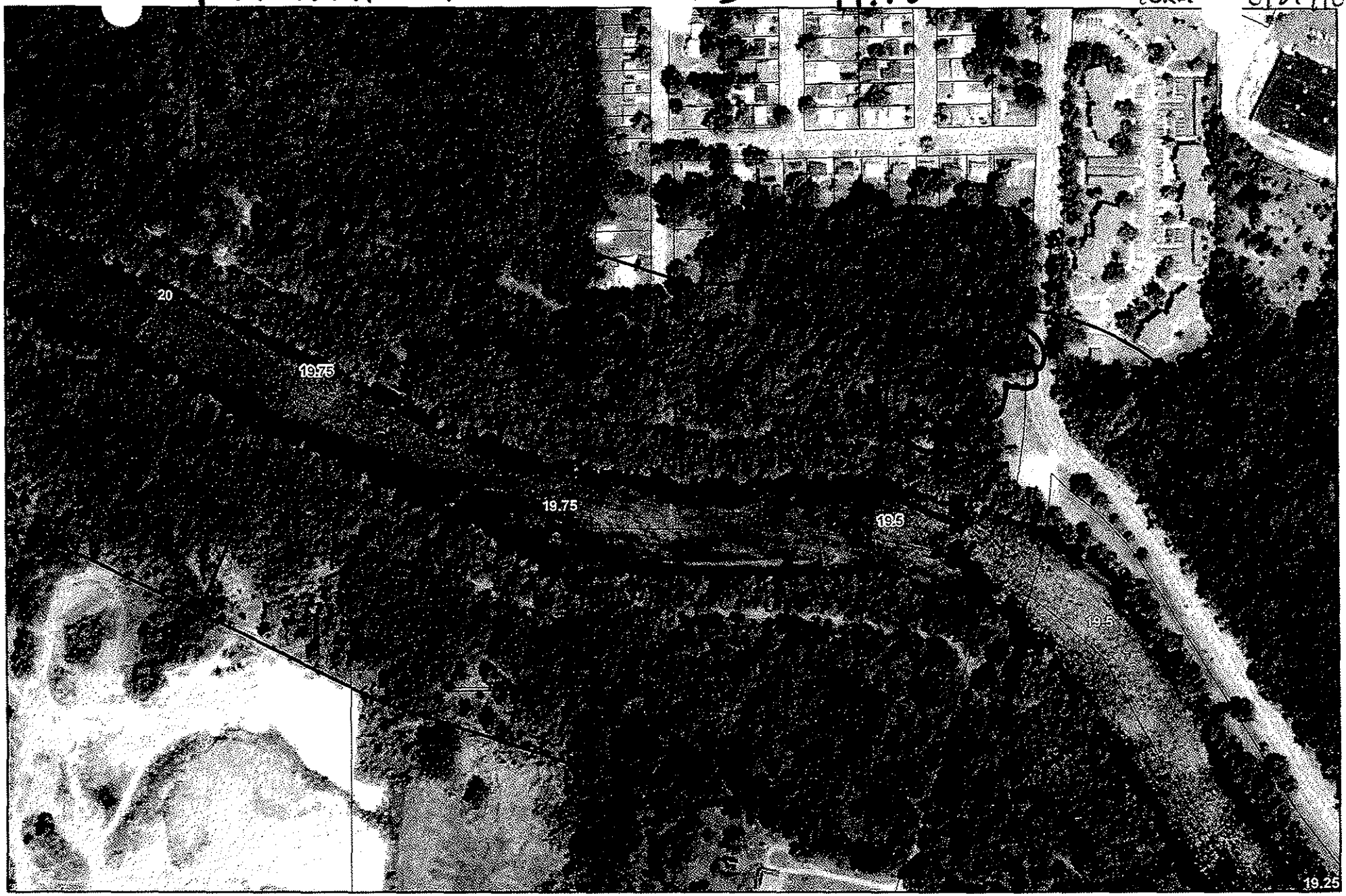
0 75 150 Feet

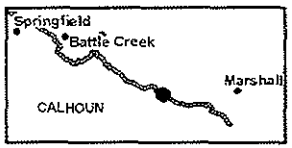
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

*problems with mile marker locations 19.75 Team 8/24/10





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division C: Mile Marker 5.75 - 6.0
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 6-Sept-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 19.5 **Start MP to End MP** 19.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/ 71°F

Field Inspection Team

Enbridge Inspector: DOUG DEREN

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All identified SCAT points marked Green.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

→ No Scat points recommended.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 7-9-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 19.5 **Start MP to End MP** 19.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

No recommended actions from SCAT

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

None

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division D: Mile Marker 19.5-19.75 Left Bank While Looking Downstream										
EPA-C-0536	T4 8/29/2010	oil sheen and tar balls					Natural Attenuation	42.34306	-85.245783	(Y) N
										Y / N
										Y / N
										Y / N
										Y / N

Printed Team Members Names: James Seiler MDNRE
Date: 9-11-10 Ross DEL ROSARIO, USEPA
Comments: Team 4 Amanda Bonnenberg

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division D: Mile Marker 19.5-19.75 Right Bank While Looking Downstream										
EPA-C-0492		SCAT T2 8/29/2010	End of 19.50? Map shows 19.50, sign says 20.0 Photo # 584 looking downstream from milepost 19.5 (should this mile marker actually be 19.25?) Photo # 586 Looking upstream from 19.50? this photo actually taken from milemarker 20.0				No Further Action Required	42.3437	-85.24458	(Y) / N

not a zone

Printed Team Members Names: James Sallee, MDNRE
Date: 9-11-10 Ross DelRosario, USEPA
Comments: Team 4 Amanda Bonnenblust

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 19.50 to MP 19.75 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

10-Sept-2010 Enbridge
Signature Ken Costley (date)

9/10/10 EPA
Signature Eduardo Rovira (date)
Eduardo Rovira

4. **SCAT Reassessment**

9/11/10 Enbridge
Signature Amanda Bohne (date)

9-11-10 EPA
Signature Ross DEL ROSARIO (date)

9-11-10 MDNRE
Signature James Soller (date)
James Soller

5. **EPA**

9/16/10 EPA Division Supervisor
Signature GARY LIPSON (date)

Appendix E
Photos



Photo 0298 – Looking west at right descending bank. Near EPA-C-0492.



Photo 0299 – Looking southeast at left descending bank. Near EPA-C-0536.



Photo 0300 – Looking northwest at right descending bank.



Photo 0301 – Looking southwest at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 20.00 – MP 19.75 to 20.00

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 20.00 had very light levels of oiling on the left descending bank and no oil observed on the right descending bank. Light oiling was noted on the underbank portion of the shore of the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Method. There were no problematic areas that required special considerations.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 20.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

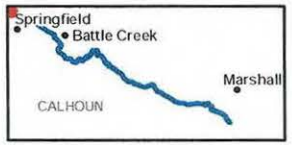
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 19.75-20.0 Left Bank While Looking Downstream										
EPA-C-0535	Shoreline	SCAT T4 08/29/2010					Islands, offshore, oil sheen and tarball present	No further action required.	42.34310	-85.24273





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 19.75-20
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

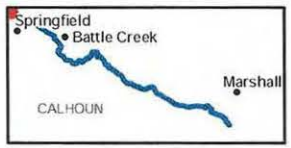
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 19.75-20.0 Right Bank While Looking Downstream										
EPA-C-0500	Shoreline	SCAT T3 08/29/2010	Light oil present on the underbank portion of the shore, however no clean-up recs. are warranted.					No further action required.	42.34371	-85.24261





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 19.75-20
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

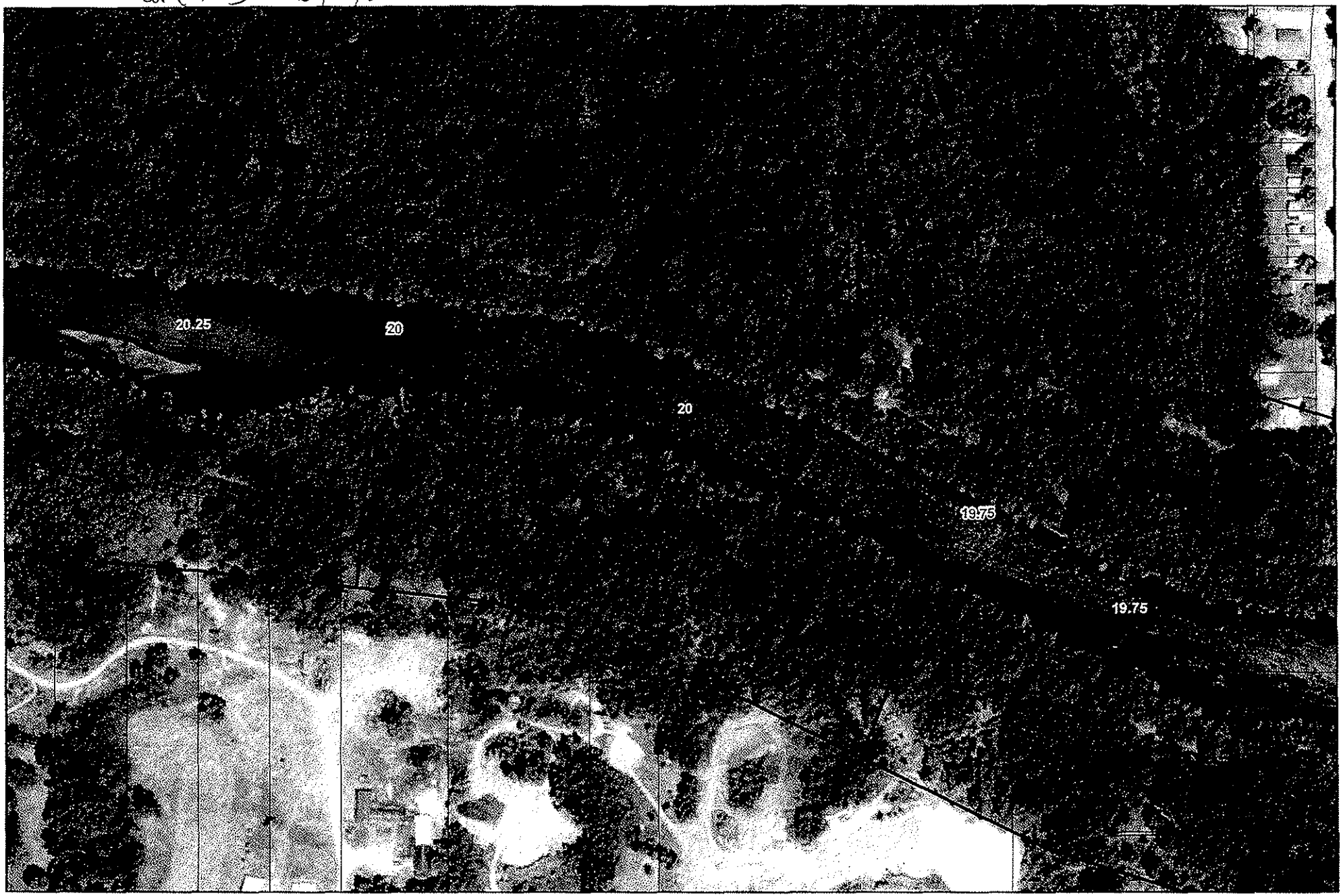
Source: Aerial Photography: USDA, 2009.

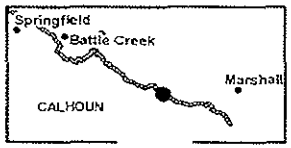
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team #3 08/29/2010





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division C: Mile Marker 5.75 - 6.0
Left Bank While Looking Downstream

Enbridge *Release Incident - Kalamazoo River Oil Spill*

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 6-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 19.75 Start MP to End MP 20.0 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 73° F

Field Inspection Team

Enbridge Inspector: Doug Dekker

Division Supervisor(Contractor): Steve Turner

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Identified SCAT point worked green. (island)

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-6-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 19.75 **Start MP to End MP** 20.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Cloud

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed SCAT report and this segment required No further action.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

None

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 19.75-20.0 Left Bank While Looking Downstream											
EPA-C-0535	Shoreline	SCAT T4 08/29/2010	Islands, offshore, oil sheen and tarball present					No further action required.	42.34310	-85.24273	Y N

Printed Team Members Names:
Date:
Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 19.75-20.0 Right Bank While Looking Downstream											
EPA-C-0500	Shoreline	SCAT T3 08/29/2010	Light oil present on the underbank portion of the shore, however no clean-up recs. are warranted.					No further action required.	42.34371	-85.24261	(Y) / N

Printed Team Members Names:
Date:
Comments:

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 19.75 to MP 20.00 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley 07-Sept-2010 (date) Enbridge

Signature Stephen Bell 9/7/10 (date) EPA

4. **SCAT Reassessment**

Signature Glenn Vanderwater 9/8/10 (date) Enbridge

Signature Christa R. Jump 9/8/10 (date) EPA

Signature Kenneth M. Mroczkonski 9/9/2010 (date) MDNRE

5. **EPA**

Signature GARY LIPSON 9/16/10 (date) EPA Division Supervisor

Appendix E
Photos



Photo 0108 – Looking southeast at left descending bank.



Photo 0109 – Looking east at right descending bank.



Photo 0110 – Looking northwest at right descending bank.



Photo 0111 – Looking west at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 20.25 – MP 20.00 to 20.25

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 20.25 had very light oiling on the left descending bank and no oil observed on the right descending bank. The overbank areas contained no areas of oil requiring clean-up. Tar balls and light oiling were observed on the islands along the left descending bank. There were no problematic areas that required special considerations.

Actions

Clean-up activities within Segment 20.25 consisted of the following:

- Removal of oiled vegetation leaving roots intact up to 10’ from waterline

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 20.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

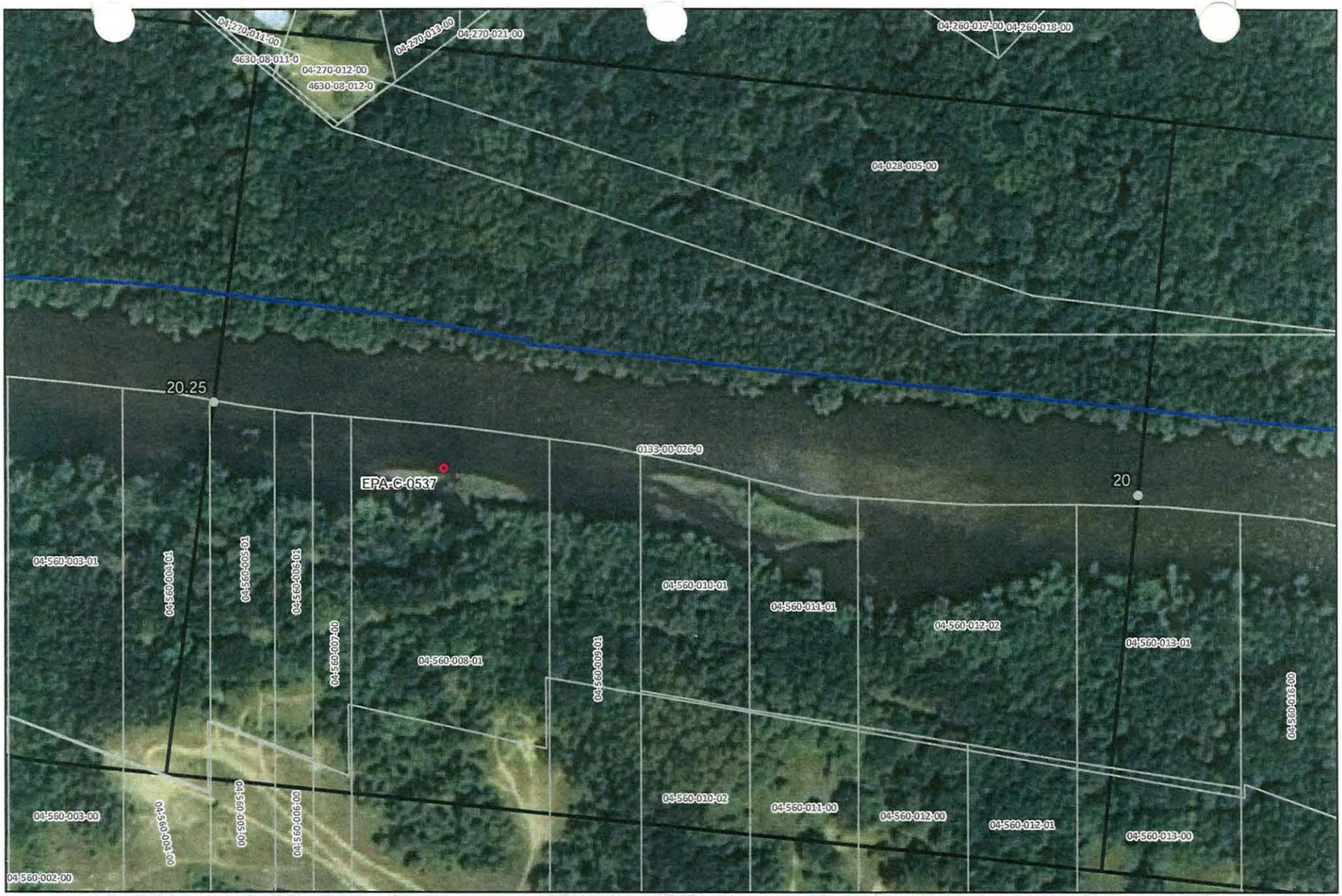
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

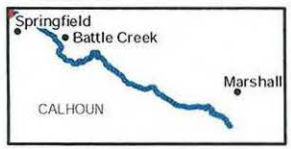
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 20.0-20.25 Right Bank While Looking Downstream										
No Operational Focus Areas Identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 20-20.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

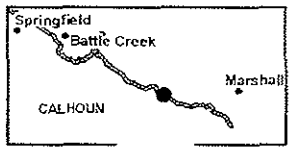
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team #0 03/29/2010 20.25





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division C: Mile Marker 5.75 - 6.0
Left Bank While Looking Downstream

Enbridge *Release Incident - Kalamazoo River Oil Spill*

0 75 150 Feet

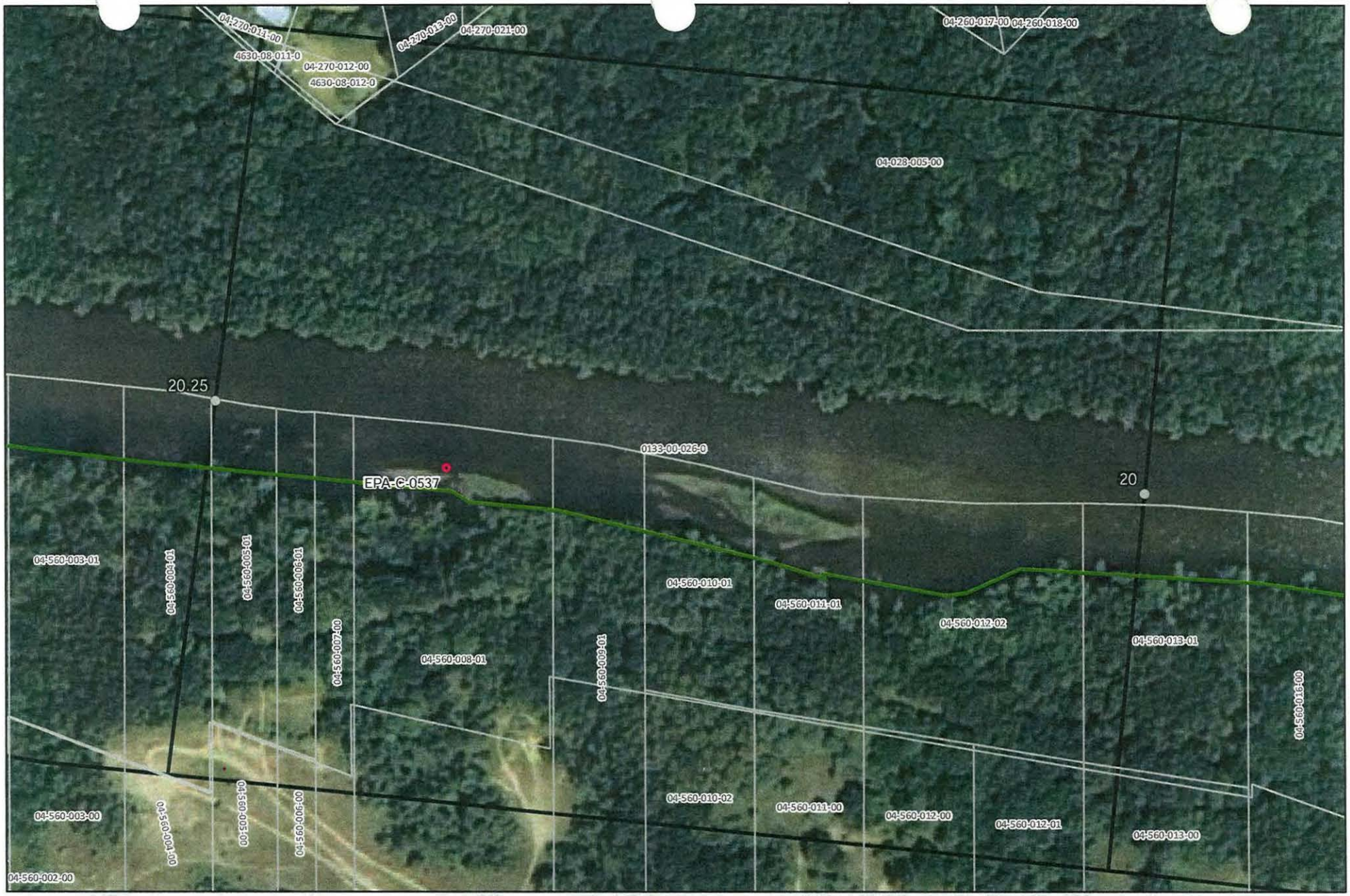
Source: Aerial Photography: USDA, 2010.

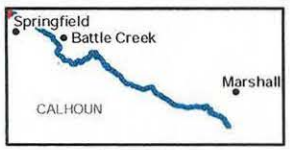
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 20.0-20.25 Left Bank While Looking Downstream										
EPA-C-0537	Shoreline	SCAT T4 08/29/2010	2 islands - not clean; oil sheen and tar balls observed					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.34540	-85.25642
EPA-C-0536	Shoreline	SCAT T4 08/29/2010	Photo 13 taken at MP; oil sheen and tar balls observed					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.34306	-85.24578





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 20-20.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

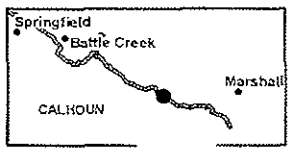
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

20.25





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division C: Mile Marker 9.75 - 8.0
Left Bank While Looking Downstream

Enbridge Pi *lease Incident - Kalamazoo River Oil Spill*

0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX

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Coord[illegible] [illegible] NAD 1983 State [illegible]th Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
CRAFT INSPECTION REPORT (CIR)

Date: 6 Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 20.0 Start MP to End MP 20.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 12°F

Field Inspection Team

Enbridge Inspector: BLRE Dave Doran 6-Sept-10

Division Supervisor(Contractor): STEVE TURNER 9-6-10

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

- Island RDB identified in LDB list had small amount of oily veg which I cut + bagged. Flagged green before I left.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-6-10 **Time: AM / PM**

Operations Division: 7 **Segment ID: From** 20.0 **Start MP to End MP** 20.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Cloud

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed SCAT report and the LDB required 2 areas to be cleaned
Clean up required is oil sheen + tarballs around

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected LDB in this area and this segment is complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 20.0-20.25 Left Bank While Looking Downstream											
EPA-C-0537	Shoreline	SCAT T4 08/29/2010	2 islands - not clean; oil sheen and tar balls observed					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.34540	-85.25642	(Y) / N
EPA-C-0536	Shoreline	SCAT T4 08/29/2010	Photo 13 taken at MP; oil sheen and tar balls observed					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.34306	-85.24578	(Y) / N

Printed Team Members Names:
Date:
Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill											
SCAT REASSESSMENT SHEET											
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 20.0-20.25 Right Bank While Looking Downstream											
No Operational Focus Areas Identified.											Y N

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 25.0 **to MP** 25.25 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK	8-30-10 (date)	Enbridge
Signature MJ MALPILSKI	30 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Karen Van Tiem	9-7-10 (date)	Enbridge Glenn Vorde Water 9/7/10 Glenn Vorde Water
Signature Kathleen M. Foley	9-7-10 (date)	EPA L. Leonova LARISA LEONOVA 9/7/10
Signature MATT WESENER	9/8/10 (date)	MDNRE Ernie Sarkipato

5. **EPA**

Signature GARY LIPSON	9/17/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0112 – Looking northwest at right descending bank.



Photo 0113 – Looking west at Island. Near EPA-C-0537.



Photo 0114 – Looking southwest at left descending bank.



Photo 0115 – Looking northwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 20.50 – MP 20.25 to 20.50

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 20.50 had very light levels of oiling on the left descending bank and no oil observed on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Cleanup Recommendations Method. There were no problematic areas that required special considerations.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 20.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

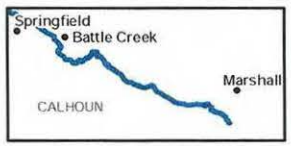
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 20.25-20.5 Left Bank While Looking Downstream										
EPA-C-0538	Shoreline	SCAT T4 08/29/2010	Photo 15 facing downstream					No further action required.	42.34469	-85.25021





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 20.25-20.5
Left Bank While Looking Downstream

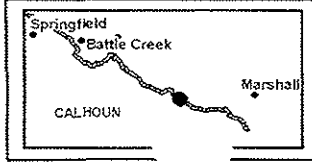
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division 3: Mile Marker 5.75 - 6.0
Left Bank While Looking Downstream

Enbridge Pi *lease Incident - Kalamazoo River Oil Spill*

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com

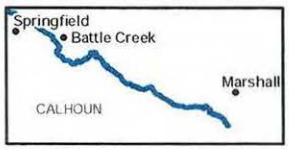
Coordi m: NAD 1983 State
Plan uth Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 20.25-20.5 Right Bank While Looking Downstream										
No Operational Focus Areas Identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 20.25-20.5
Right Bank While Looking Downstream

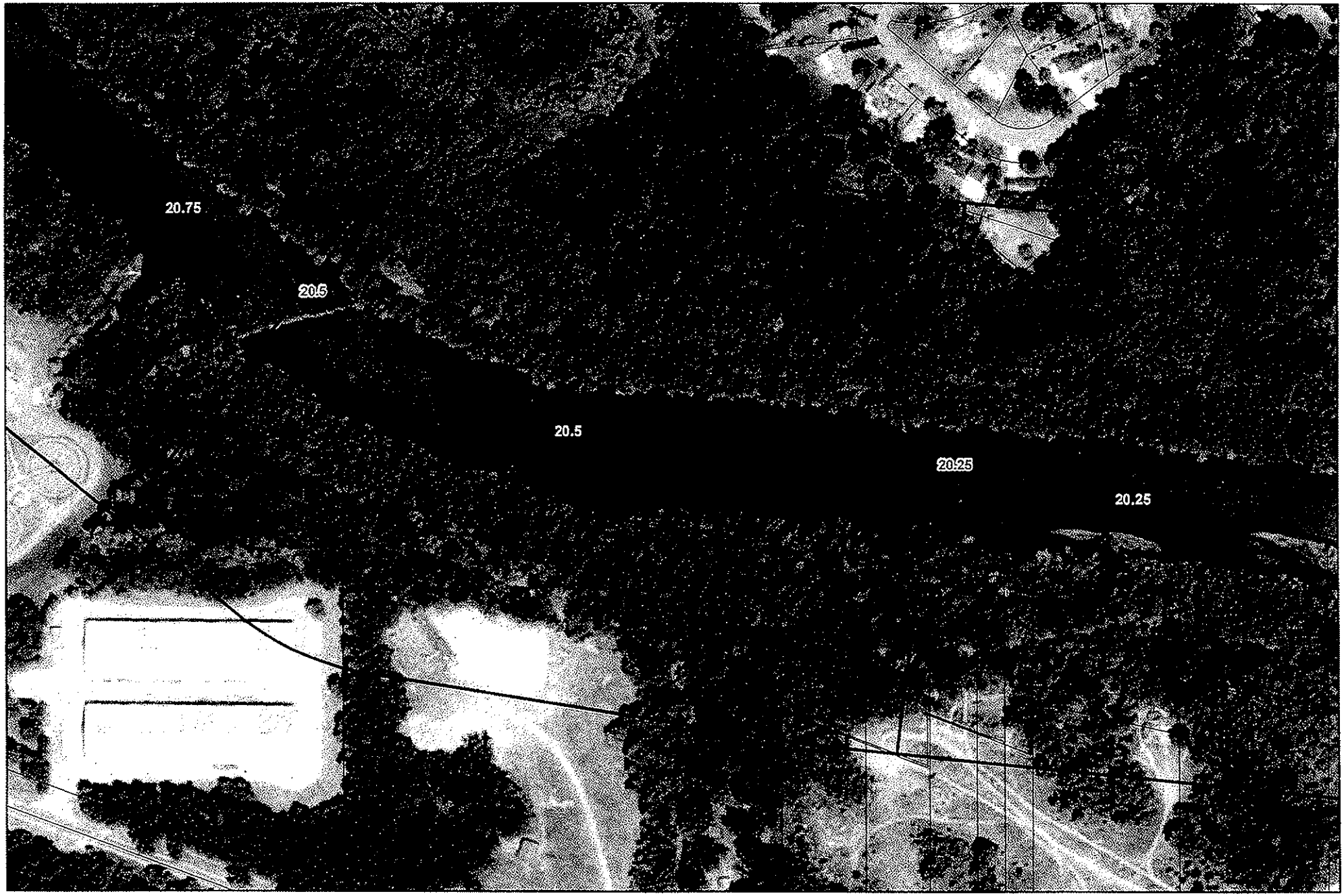
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

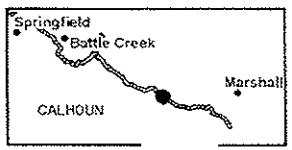
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division C: Mile Marker 5.75 - 6.0
Left Bank While Looking Downstream

Enbridge Pi[illegible] [illegible]lease Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com
Coordi[illegible] [illegible]m: NAD 1983 State Plane [illegible]th Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 6-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 20.25 Start MP to End MP 20.5 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 74° F

Field Inspection Team

Enbridge Inspector: BLR Doug Degen

Division Supervisor(Contractor): Steve Turner

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Nothing noted in SCAT report

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 2025 **Start MP to End MP** 20.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

No further Action required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

None

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 20.25-20.5 Left Bank While Looking Downstream											
EPA-C-0538	Shoreline	SCAT T4 08/29/2010	Photo 15 facing downstream					No further action required.	42.34469	-85.25021	(Y) / N

Printed Team Members Names:
Date:
Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 20.25-20.5 Right Bank While Looking Downstream											
SCD2-14	Shoreline	Shoreline Assessment					No Comments	No Recommendations	42.346667	-85.26195	(Y) N

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 20.25 to MP 20.50 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley 07-Sept-2010 (date) Enbridge

Signature Stephen Ball 9/7/10 (date) EPA

4. **SCAT Reassessment**

Signature Glenn Underwood 9/8/10 (date) Enbridge

Signature Christine R. Jump 9/8/10 (date) EPA

Signature Kenneth M. Mroczkowski 9/8/2010 (date) MDNRE

5. **EPA**

Signature Gary Lipson 9/16/10 (date) EPA Division Supervisor

Appendix E
Photos



Photo 0116 – Looking northwest at right descending bank.



Photo 0117 – Looking southwest at left descending bank.



Photo 0118 – Looking northwest at right descending bank.



Photo 0119 – Looking west at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 20.75 – MP 20.50 to 20.75

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 20.75 had very light levels of oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 20.75 consisted of the following:

- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Woody vegetation less than 2” in diameter removed
- Removal of oiled vegetation leaving roots intact up to 10’ from waterline
- Removal of overhanging vegetation
- Removal of oiled debris

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 20.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

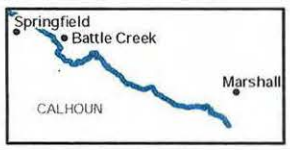
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 20.5-20.75 Left Bank While Looking Downstream										
SCD2-15	Shoreline	Shoreline Assessment						Reference point only. No recommendations provided.	42.34665	-85.26248
SCD2-16	Shoreline	Shoreline Assessment			X	X	Stained overhanging vegetation	Cut and remove branches.	42.34775	-85.26463
SCD2-17	Shoreline	Shoreline Assessment	X	X	X	X	Stained log & pooled oil	Snare pooled oil. Cut and remove.	42.34815	-85.26537
EPA-C-0540	Shoreline	SCAT T4 08/29/2010	Photo 17 facing downstream					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.34856	-85.26657





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 20.5-20.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

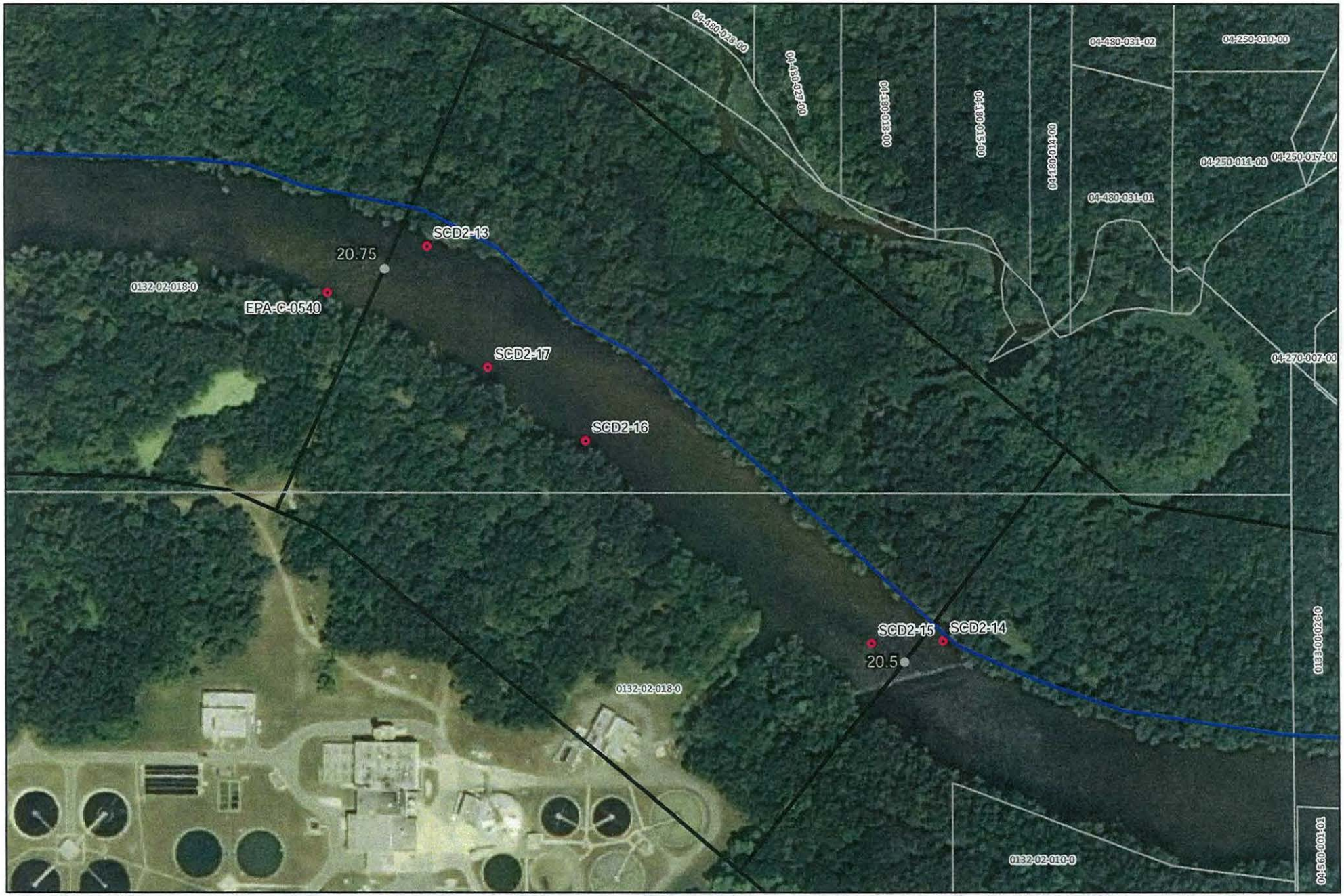
ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 20.5-20.75 Right Bank While Looking Downstream										
SCD2-13	Shoreline	Shoreline Assessment	X			X	Oil accumulated on surface in log area, oil stained wood debris	Snare oil and remove debris.	42.34882	-85.26583





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 20.5-20.75
Right Bank While Looking Downstream

Enbridge Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

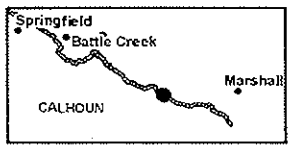
www.entrix.com

Coordinate System: NAD 1983 State Plane South Feet

Team #3 08/27/2010

20.15





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division C: Mile Marker 5.75 - 6.0
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 7-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 80.5 Start MP to End MP 20.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 76° F

Field Inspection Team

Enbridge Inspector: BLR Dave Dean.

Division Supervisor(Contractor): Sto 2 STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 20.5 **Start MP to End MP** 20.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 4 areas of concern from the SCAT report.
Clean up required is flushing, Pooling, Veg. removal, and debris removal.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 4 areas of concern from the SCAT report.
All clean up is complete in this area according to the recommendations from SCAT

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 20.5-20.75 Left Bank While Looking Downstream											
SCD2-15	Shoreline	Shoreline Assessment						Reference point only. No recommendations provided.	42.34665	-85.26248	(Y) / N
SCD2-16	Shoreline	Shoreline Assessment			X	X	Stained overhanging vegetation	Cut and remove branches.	42.34775	-85.26463	(Y) / N
SCD2-17	Shoreline	Shoreline Assessment	X	X	X	X	Stained log & pooled oil	Snare pooled oil. Cut and remove.	42.34815	-85.26537	(Y) / N
EPA-C-0540	Shoreline	SCAT T4 08/29/2010	Photo 17 facing downstream					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.34856	-85.26657	(Y) / N

Printed Team Members Names:
Date:
Comments:

Sheen present in trapped upstream of debris

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 20.5-20.75 Right Bank While Looking Downstream											
SCD2-13	Shoreline	Shoreline Assessment	X			X	Oil accumulated on surface in log area, oil stained wood debris	Snare oil and remove debris.	42.34882	-85.26583	(Y) N

Printed Team Members Names:
Date:
Comments:

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 20.50 to MP 20.75 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley 07-Sept-2010 (date) Enbridge

Signature Stephen Ball 9/7/10 (date) EPA

4. **SCAT Reassessment**

Signature Glenn VanWieren 9/8/10 (date) Enbridge

Signature Christine R. Jump 9/8/10 (date) EPA

Signature Kenneth M. Mroczkowski 9/8/2010 (date) MDNRE

5. **EPA**

Signature GARY LIPSON 9/16/10 (date) EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 20.75



Photo 0120 – Looking southwest at left descending bank. Near SCD2-15.



Photo 0121 – Looking west at left descending bank.

Field Photo Log – Segment MP 20.75



Photo 0122 – Looking northwest at right descending bank.



Photo 0123 – Looking southwest at left descending bank. Near SCD2-16.

Field Photo Log – Segment MP 20.75



Photo 0124 – Looking southwest at left descending bank. Near SCD2-17.



Photo 0125 – Looking northeast at right descending bank. Near SCD2-13.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 21.00 – MP 20.75 to 21.00

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 21.00 had very light levels of oiling on left descending bank, including oiled overhanging branches. The right descending bank itself was not oiled but pooled oil in a small alcove and oiled overhanging branches were observed. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

The clean-up activities within Segment 21.00 consisted of the following:

- High volume low pressure flushing for free oil removal with downstream booming and absorbent
- Woody vegetation less than 2" in diameter removed
- Removal of oiled vegetation leaving roots intact up to 10' from waterline
- Removal of oiled debris
- Removal of overhanging limbs

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 21.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

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PT	Patties (discrete accumulations of oil >10 cm in diameter)
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SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
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DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

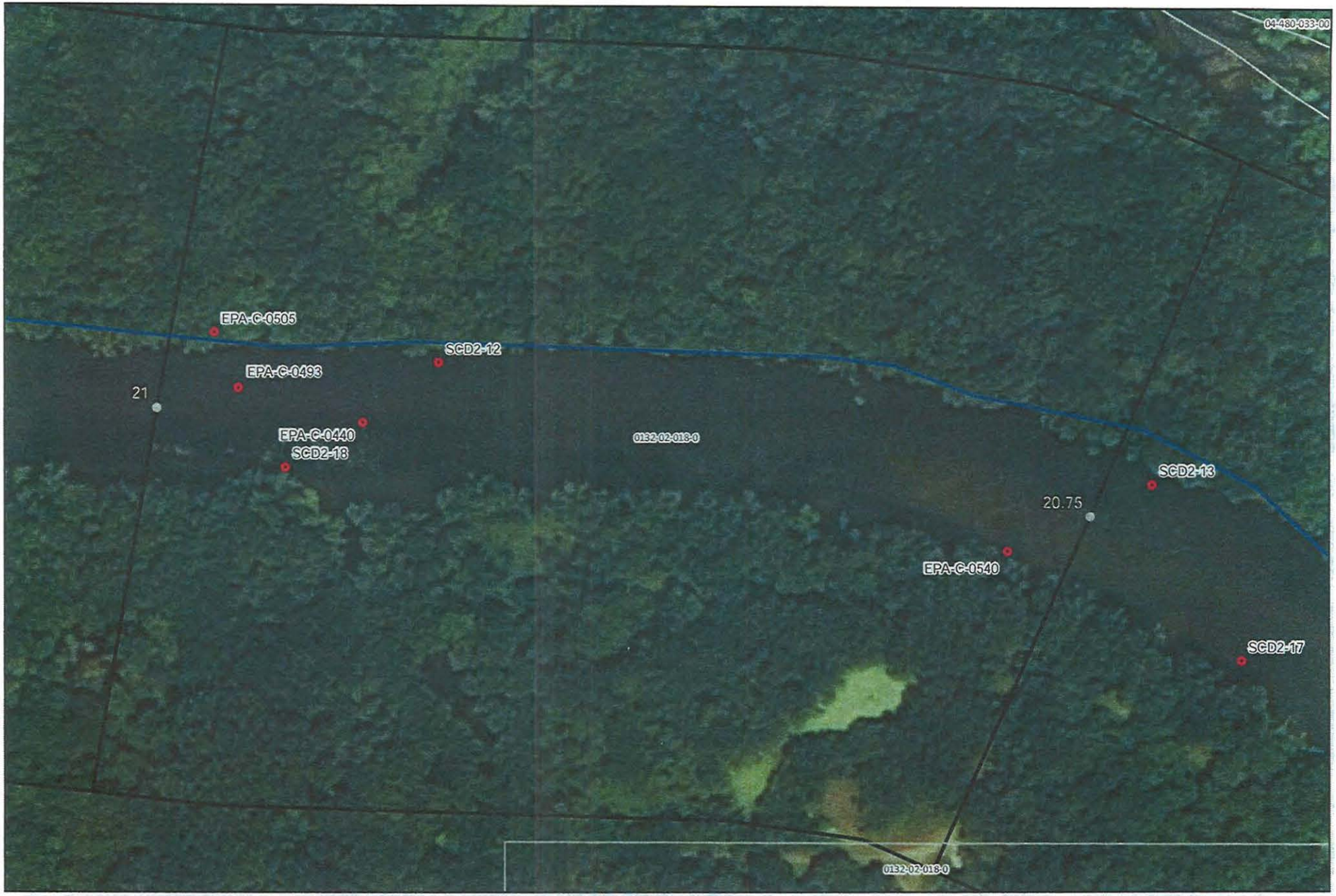
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

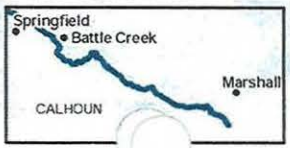
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 20.75-21.0 Right Bank While Looking Downstream										
SCD2-12	Shoreline	Shoreline Assesment	X	X	X	X	Pooled oil in small alcove, oiled overhanging vegetation	Snare and remove oil.	42.34925	-85.26952
EPA-C-0493	Channel	SCAT T2 08/29/2010	End of segment 21.0 Photo # 588 Looking downstream from MP 20.75 Photo #589 Looking upstream from MP 21.0 Trace amounts of film on sand along shoreline <1%					No further action required.	42.34915	-85.27055





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 20.75-21
Right Bank While Looking Downstream

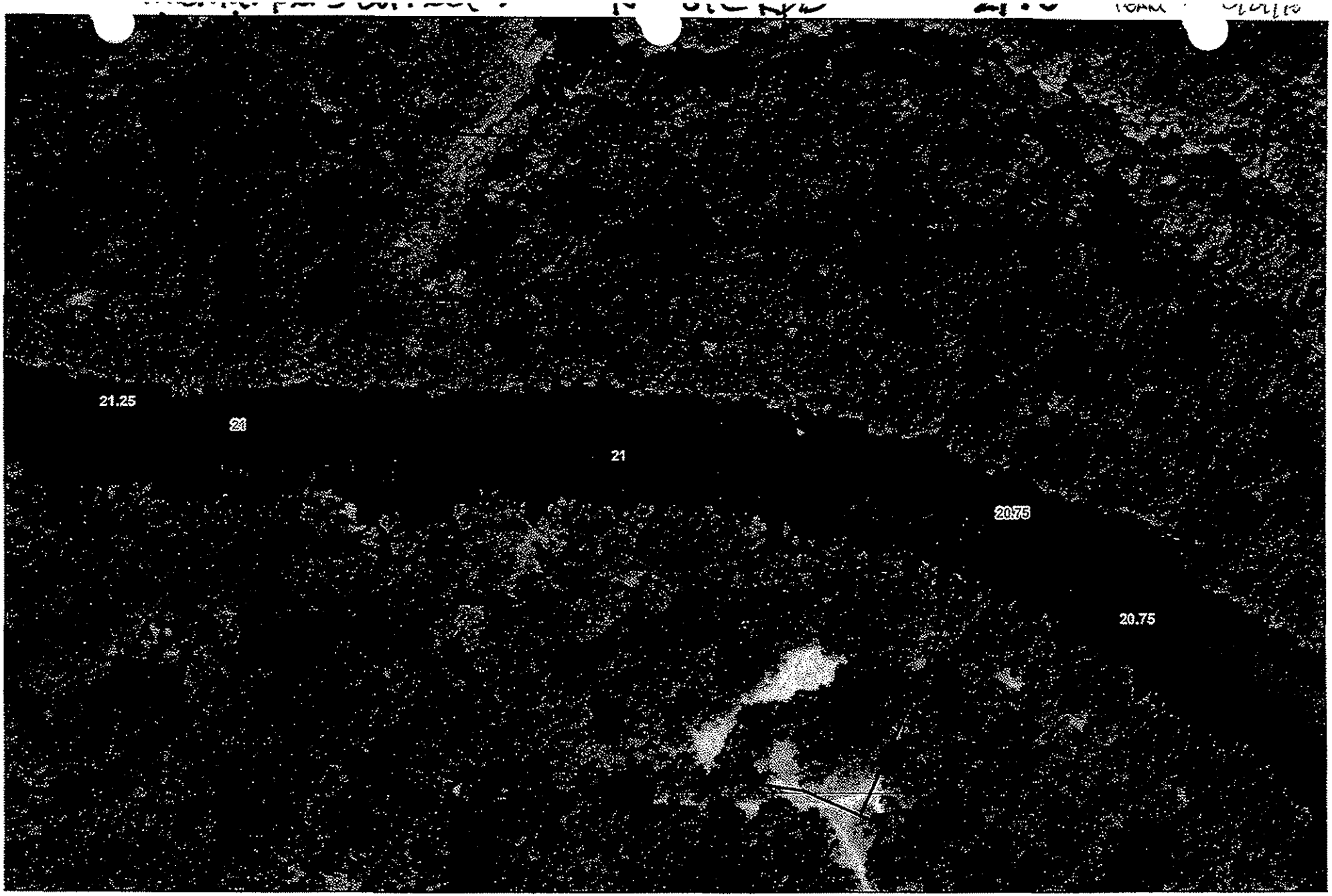
Enbridge Release Incident - Kalamazoo River Oil Spill

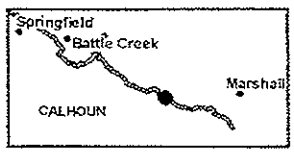
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Co... ...stem: NAD 1983 State
Pl... South Feet





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division 3 Mile Marker 6.75 - 6.0
Left Bank/White Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2010.

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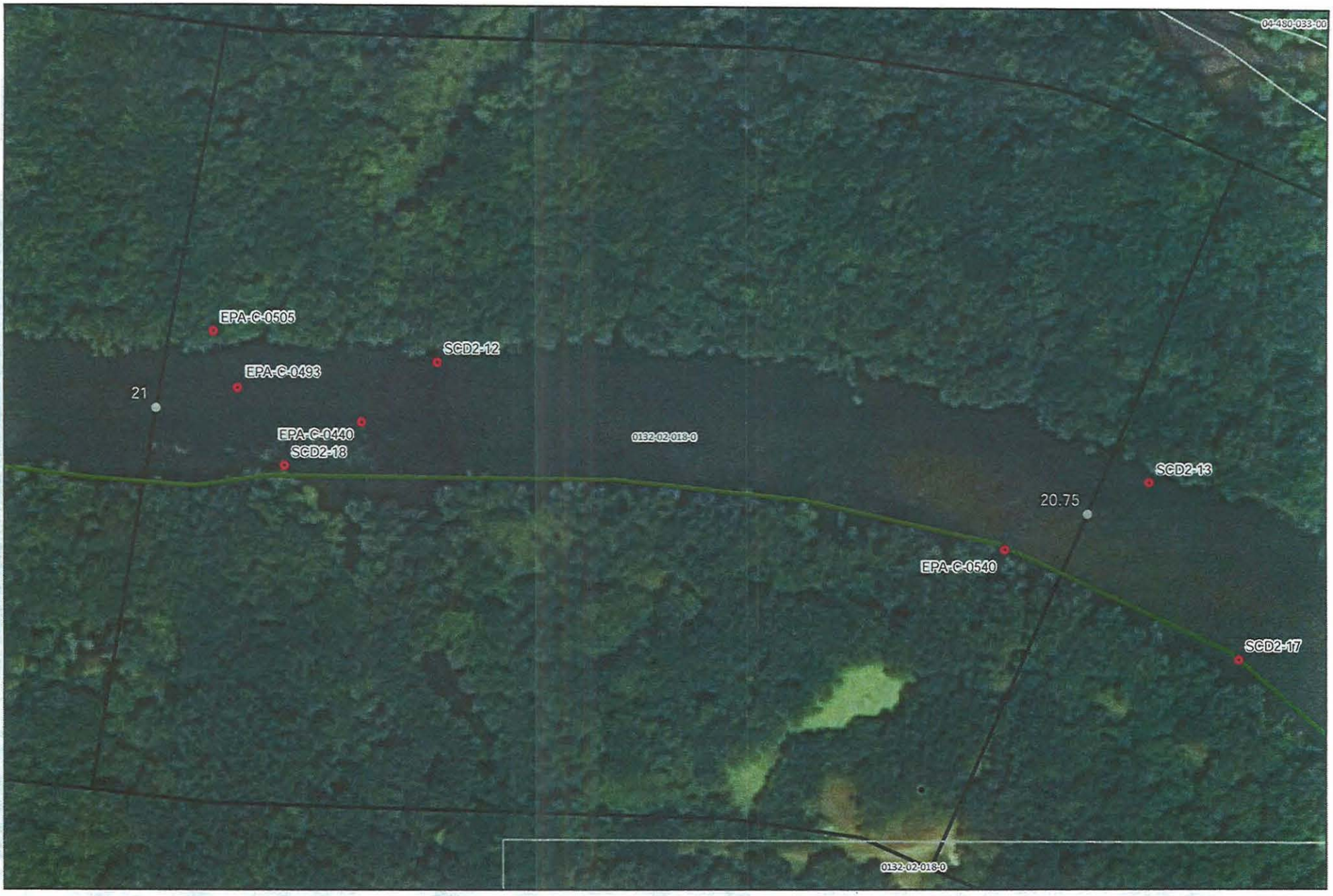
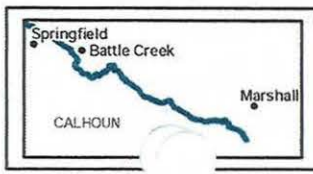
Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 20.75-21.0 Left Bank While Looking Downstream										
SCD2-18	Shoreline	Shoreline Assesment	?		X	X	Heavily oiled overhanging branches	Cut and remove branches & dispose.	42.34885	-85.27030
EPA-C-0440	Shoreline	SCAT T1 08/31/2010	mp 21.0					No further action required.	42.34902	-85.26990





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 20.75-21
Left Bank While Looking Downstream

Enbridge [illegible] Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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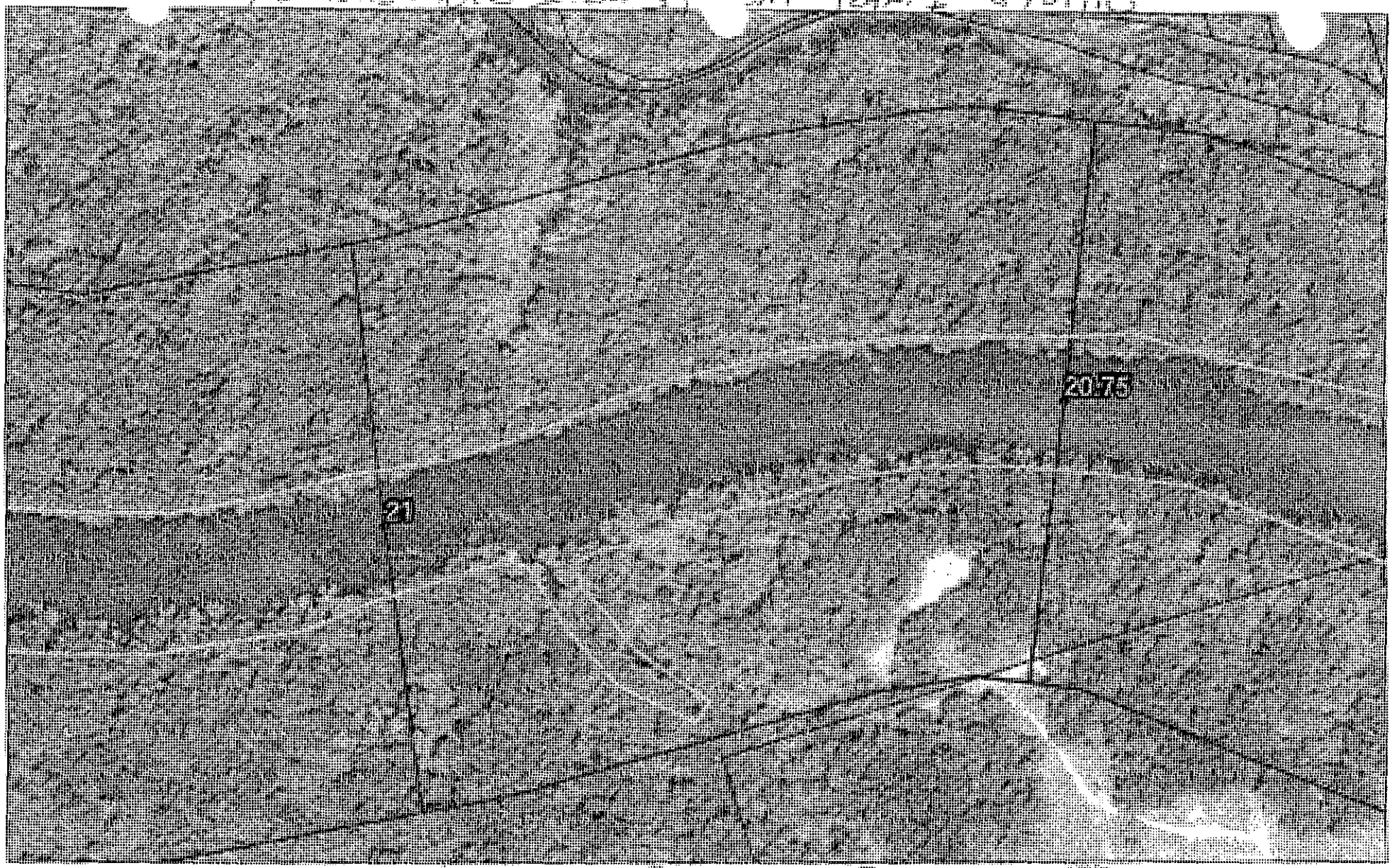
Coo[illegible]em: NAD 1983 State Pla[illegible] South Feet



Quarter Mile Markers
Parcels_10200ft Buffer
Shoreline
River_QuarterMiles
Divisions

20.75 to 21

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2008 NAIP

SHEET 4 of 48

ENTRIX
Down to Earth, Down to Business

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Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 7-Sept.10 Time: AM / PM

Operations Division: D Segment ID: From 20.75 Start MP to End MP 21.0 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 76 F

Field Inspection Team

Enbridge Inspector: Dave Deren.

Division Supervisor(Contractor): Steve Turner

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

All Identified SCAT points marked green

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 20.75 **Start MP to End MP** 21.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

Reviewed 2 areas of concern from the SCAT report.
Cleanup required, Flushing, pooling, Veg. & debris removal, and over hanging Limbs.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 2 areas of concern from the SCAT report.
All clean up is complete according to the recommendations from SCAT.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill											
SCAT REASSESSMENT SHEET											
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 20.75-21.0 Left Bank While Looking Downstream											
SCD2-18	Shoreline	Shoreline Assesment	?		X	X	Heavily oiled overhanging branches	Cut and remove branches & dispose.	42.34885	-85.27030	Y ? N
EPA-C-0440	Shoreline	SCAT T1 08/31/2010	mp 21.0 end of seg.					No further action required.	42.34902	-85.26990	Y / N

Printed Team Members Names:
Date:
Comments:

→ not a zone, nothing to sign off on

- small alcove contains oiled shoreline, perhaps initial scat offered no rec.
- vegetation along LDB had been cut, unsure if the cut veg matches the zone.
- flag matches alcove, and we saw no signs of cut veg within alcove.
- Right & left sides of bank data have been switched

9/8/10
Team 4
Amanda Bohnenblust
Jose Negrin
Ernst Schrader

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill											
SCAT REASSESSMENT SHEET											
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 20.75-21.0 Right Bank While Looking Downstream											
SCD2-12	Shoreline	Shoreline Assesment	X	X	X	X	Pooled oil in small alcove, oiled overhanging vegetation	Snare and remove oil.	42.34925	-85.26952	(Y) / N
EPA-C-0493	Channel	SCAT T2 08/29/2010	End of segment 21.0 Photo # 588 Looking downstream from MP 20.75 Photo #589 Looking upstream from MP 21.0 Trace amounts of film on sand along shoreline <1%					No further action required.	42.34915	-85.27055	(Y) N

Printed Team Members Names:
Date:
Comments:

Land a zone, no reason to sign off

9/8/10
Team 4
Amanda Bohnalls
Jose Negron
Ernest Swicegood

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 20.75 to MP 21.00 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

07-Sept-2010 — Signature Ken Corthey (date) — Enbridge

9/7/10 — Signature Stephen Ball (date) — EPA

4. **SCAT Reassessment**

9/8/10 — Signature Ehorst Surkipatt (date) — ~~Enbridge~~ MDNRE

9/9/10 — Signature JOSE A NEGRON (date) — EPA

9/8/10 — Signature Amanda Bohnet (date) — ~~MDNRE~~ Enbridge

5. **EPA**

9/16/10 — Signature GARY LIPSON (date) — EPA Division Supervisor

Appendix E
Photos



Photo 0126 – Looking northwest at right descending bank.



Photo 0127 – Looking southwest at left descending bank. Near EPA-C-0540.



Photo 0128 – Looking northwest at right descending bank.



Photo 0129 – Looking southwest at left descending bank.

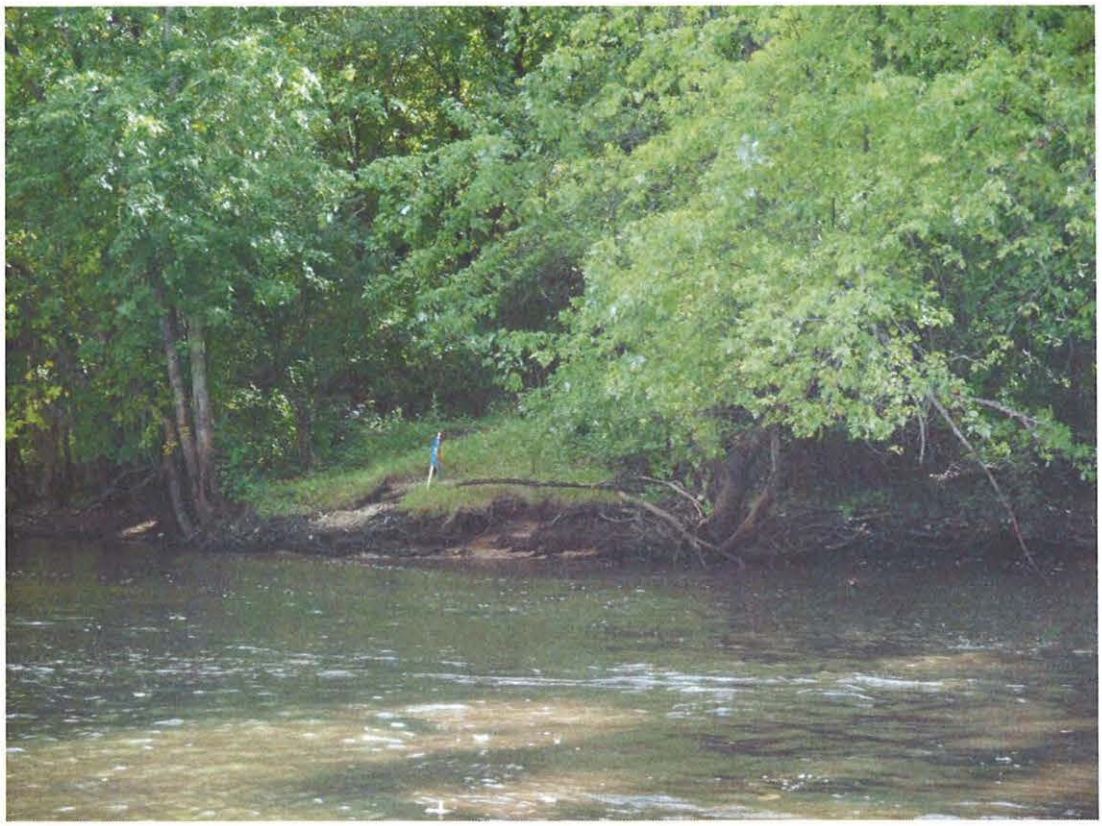


Photo 0130 – Looking south at left descending bank. Near SCD2-18.



Photo 0131 – Looking north at right descending bank. Near SCD2-12.



Photo 0132 – Looking north at right descending bank. Near EPA-C-0493.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 21.25 – MP 21.00 to 21.25

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 21.25 had very light oiling on the left descending bank, except for oiled overhanging branches and oiled debris. No oiling was observed on the right descending bank with pooled oil in a small alcove and some oiled debris. The overbank areas contained no areas of oil requiring clean-up and islands were not present.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions. The clean-up activities within Segment 21.25 consisted of the following:

- High volume low pressure flushing for free oil removal with downstream booming and absorbent
- Woody vegetation less than 2" in diameter removed
- Removal of oiled vegetation leaving roots intact up to 10' from waterline
- Removal of oiled debris
- Removal of overhanging limbs

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 21.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

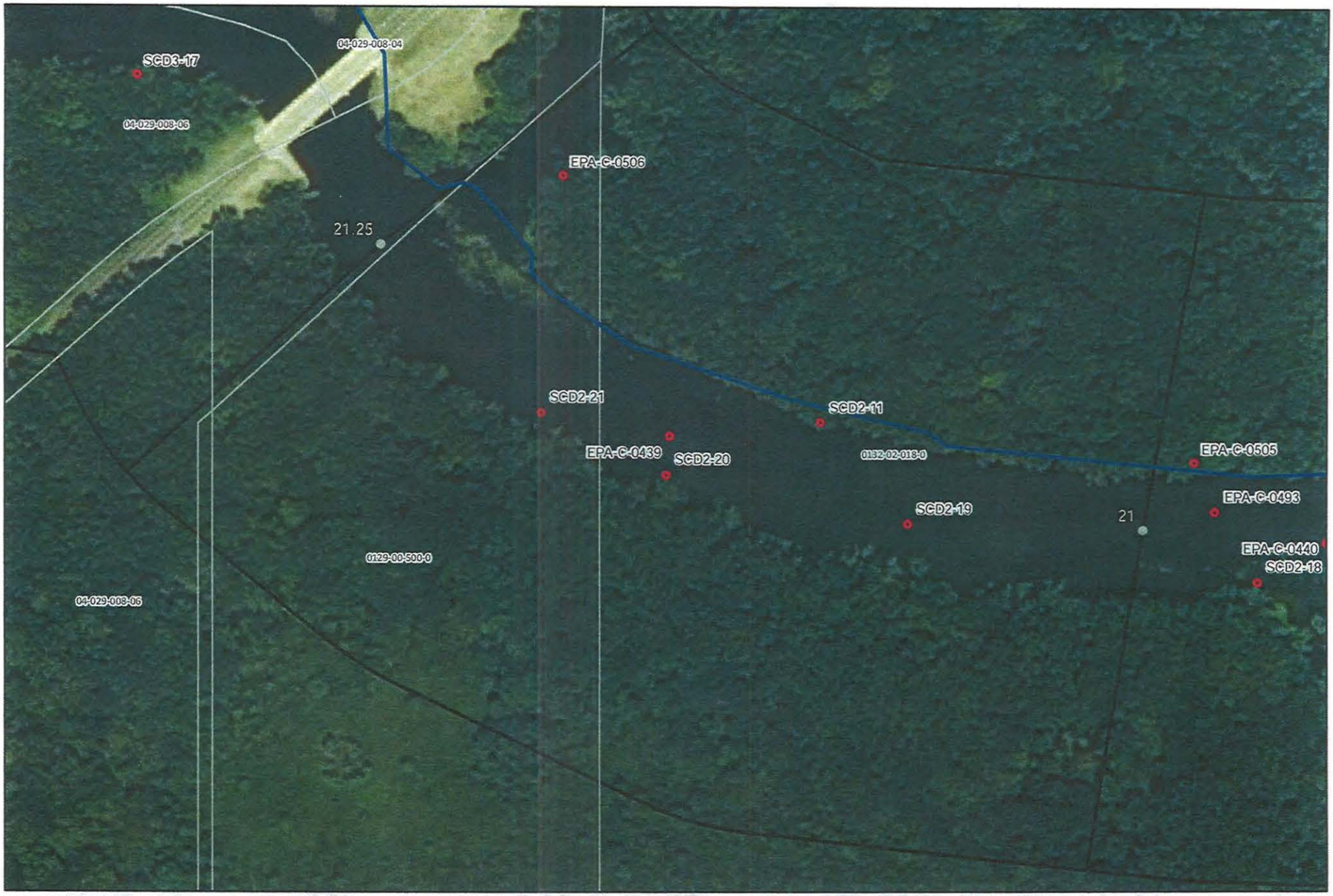
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

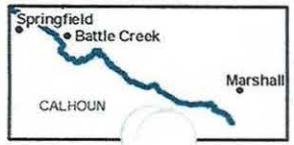
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 21.0-21.25 Right Bank While Looking Downstream										
SCD2-11	Shoreline	Shoreline Assesment	X	X		X		Pooled oil in alcove. Snare and collect oil and dispose.	42.34952	-85.27285
EPA-C-0506	Channel	SCAT T2 08/30/2010	GPS @ milemarker 21.25 photo 591 looking upstream from mile marker 21.25; workers have cut overhanging veg; small amount of mousse building up at logjams; we followed tributary at milepost 21.25 about 500 feet and did not see any evidence that oil entered it					No further action required.	42.35057	-85.27437
EPA-C-0505	Channel	SCAT T2 08/30/2010	GPS at MP 21.0 photo 590 looking downstream from MP 21.0; workers have cut overhanging veg; small amount of mousse building up at logjams; we followed tributary at milepost 21.25 about 500 feet and did not see any evidence that oil entered it					No further action required.	42.34936	-85.27067





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 21-21.25
Right Bank While Looking Downstream

Enbridge Release Incident - Kalamazoo River Oil Spill

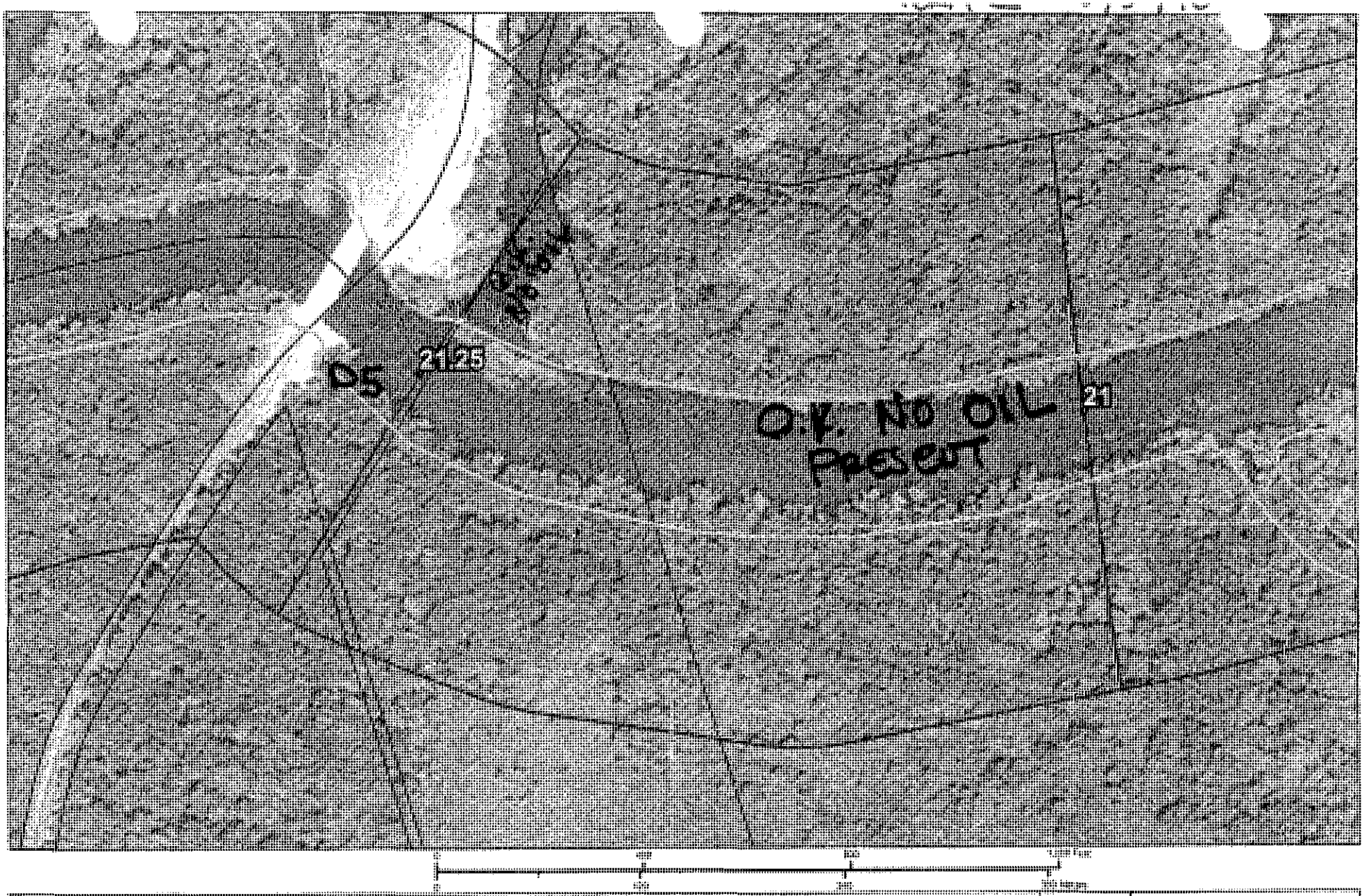
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane South Feet



21 to 21.25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

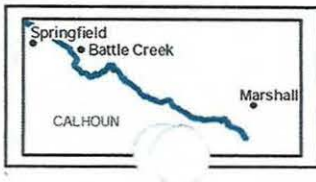
ENTRIX

www.entrix.com

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 21.0-21.25 Left Bank While Looking Downstream										
SCD2-19	Shoreline	Shoreline Assesment	?		X	X		Heavily oiled overhanging branches. Cut and remove branches & dispose.	42.34908	-85.27233
SCD2-20	Shoreline	Shoreline Assesment	?		X	X		Heavily oiled overhanging branches. Cut and remove branches & dispose.	42.34928	-85.27375
SCD2-21	Shoreline	Shoreline Assesment	X			X		Coated wood debris. Flush to skimmer. Note skimmer immediately below 50 meters.	42.34955	-85.27448
EPA-C-0439	Shoreline	SCAT T1 08/31/2010						No further action required	42.34945	-85.27373





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 21-21.25
Left Bank While Looking Downstream

Enbridge Release Incident - Kalamazoo River Oil Spill

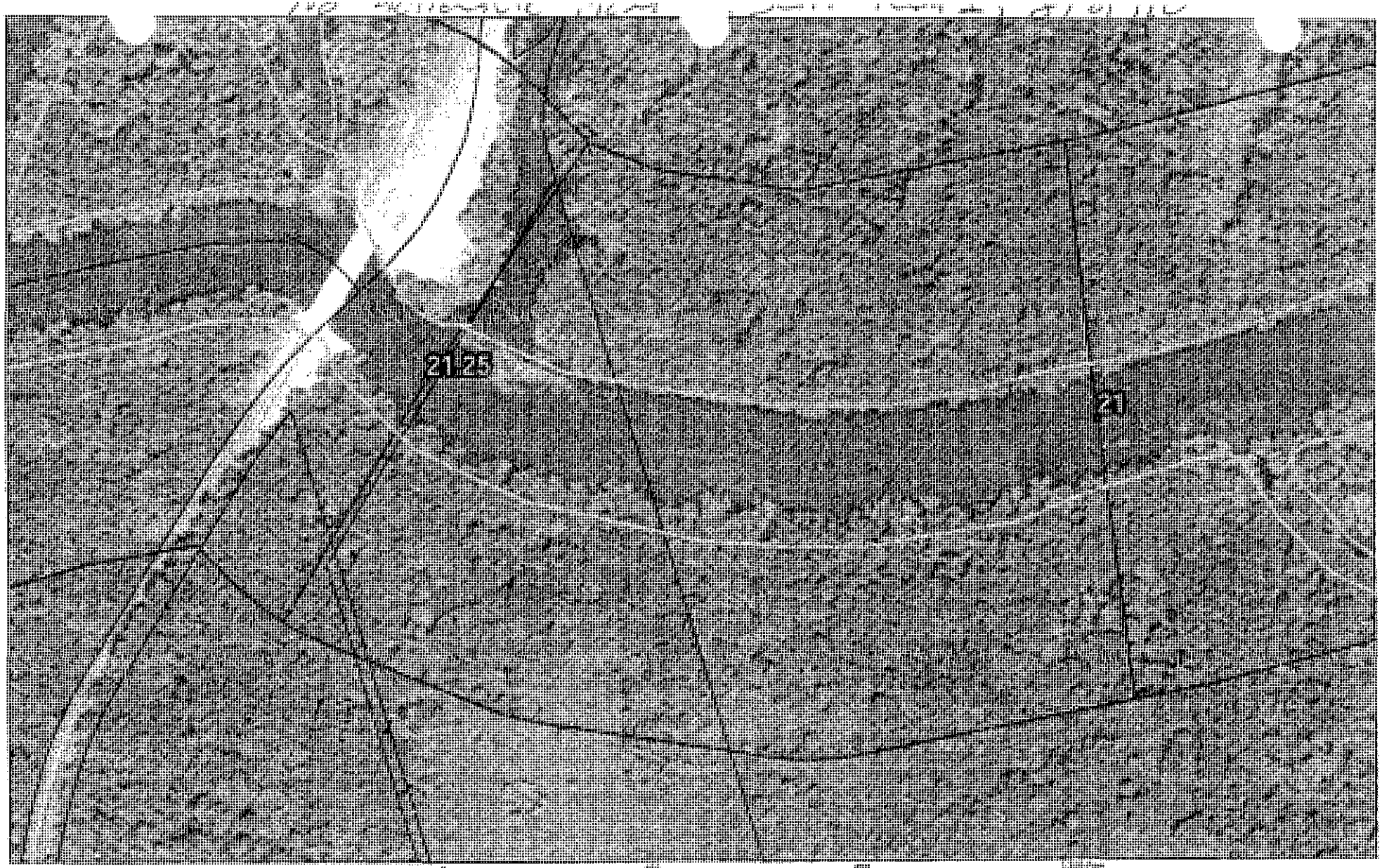
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Co tem: NAD 1983 State
Pl South Feet



21 to 21.35

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 7-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 21.0 Start MP to End MP 21.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 76 °F

Field Inspection Team

Enbridge Inspector: [signature] Doug Deren

Division Supervisor(Contractor): [signature] Steve Turner

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Revised9/01/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 21.0 **Start MP to End MP** 21.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 4 areas of concern from the SCAT report.
Clean up required is flushing, veg. & debris removal and pool oil.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 4 areas of concern ~~from~~ the SCAT report
Clean up is complete according to the recommendations from SCAT

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill											
SCAT REASSESSMENT SHEET											
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 21.0-21.25 Left Bank While Looking Downstream											
SCD2-19	Shoreline	Shoreline Assesment	?		X	X		Heavily oiled overhanging branches. Cut and remove branches & dispose.	42.34908	-85.27233	Y / N
SCD2-20	Shoreline	Shoreline Assesment	?		X	X		Heavily oiled overhanging branches. Cut and remove branches & dispose.	42.34928	-85.27375	Y / N
SCD2-21	Shoreline	Shoreline Assesment	X			X		Coated wood debris. Flush to skimmer. Note skimmer immediately below 50 meters.	42.34955	-85.27448	Y N
EPA-C-0439	Shoreline	SCAT T1 08/31/2010						No further action required	42.34945	-85.27373	Y ~~N~~

Printed Team Members Names:
Date:
Comments:

↳ not a zone, no reason to sign

- These sites went flaged, but we drove the shoreline and there was no oiled woody vegetation or overhanging branches

9/8/10
Team 4
Amanda Bolt
Jose Negrin
Ernst Surhiputi

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill											
SCAT REASSESSMENT SHEET											
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 21.0-21.25 Right Bank While Looking Downstream											
SCD2-11	Shoreline	Shoreline Assesment	X	X		X		Pooled oil in alcove. Snare and collect oil and dispose.	42.34952	-85.27285	Y N
EPA-C-0506	Channel	SCAT T2 08/30/2010	GPS @ milemarker 21.25 photo 591 looking upstream from mile marker 21.25; workers have cut overhanging veg; small amount of mousse building up at logjams; we followed tributary at milepost 21.25 about 500 feet and did not see any evidence that oil entered it					No further action required.	42.35057	-85.27437	Y N
EPA-C-0505	Channel	SCAT T2 08/30/2010	GPS at MP 21.0 photo 590 looking downstream from MP 21.0; workers have cut overhanging veg; small amount of mousse building up at logjams; we followed tributary at milepost 21.25 about 500 feet and did not see any evidence that oil entered it					No further action required.	42.34936	-85.27067	Y N

Printed Team Members Names:
Date:
Comments:

→ not zones, no reason to sign off

91810
Team 4
Amanda Bohnell
Ernst Surlapato
Jose Nogm

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 21.00 to MP 21.25 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley 07-Sept-2010 (date) Enbridge

Signature Stephen Ball 9/7/10 (date) EPA

4. **SCAT Reassessment**

Signature Ernest Surkipato 9/8/10 (date) ~~Enbridge~~ MOORE

Signature JOSE A. NEGRON 9/8/10 (date) EPA

Signature Amanda Bohnenblust 9/8/10 (date) ~~MDNRE~~ Enbridge

5. **EPA**

Signature GARY LIPSON 9/16/10 (date) EPA Division Supervisor

Appendix E
Photos



Photo 0133 – Looking northwest at right descending bank.



Photo 0134 – Looking southwest at left descending bank.



Photo 0135 – Looking northwest at right descending bank.

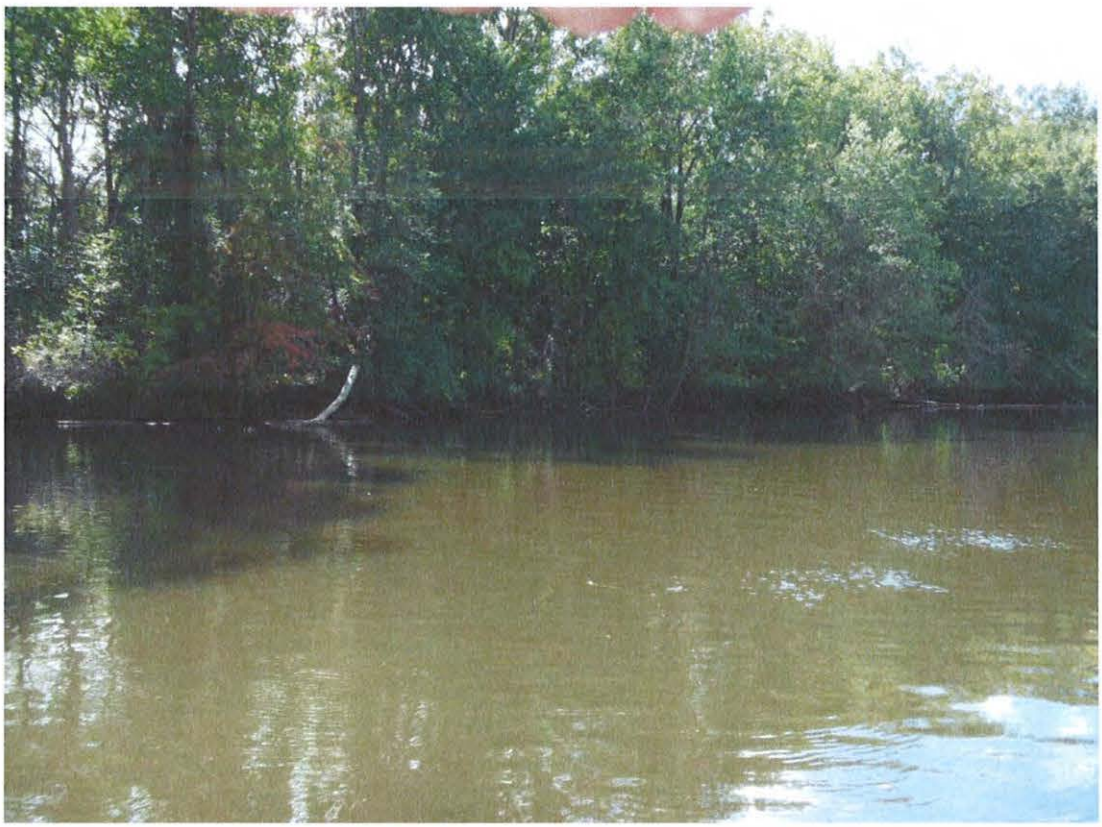


Photo 0136 – Looking west at left descending bank.

Field Photo Log – Segment MP 21.25



Photo 0137 – Looking east at left descending bank. Near EPA-C-0506.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 21.5 – MP 21.25 to 21.5

Enbridge Energy

September 21, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 21.5 had very light levels of oil staining on the left descending bank. Oiled trees and overhanging vegetation were observed along the shoreline/overbank. One island/oxbow is present within the segment. Although no oil was observed in this area during the initial shoreline assessment, oiled vegetation and debris was observed along the shoreline of the island/oxbow during the SCAT process. The right descending bank had very light levels of staining on the upstream portion; including oiled overhanging vegetation and pooled oil. No staining was observed on the downstream portion of the right descending bank during the initial shoreline assessment, however, tree rings with stained or coated oil were observed along this portion of the bank during the SCAT process, as well as sheen/oil on the water.

Actions

The shoreline clean-up activities within Segment 21.5 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Removal of coated oil through low pressure, cold water wash followed by natural attenuation;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Vegetation removal, leaving roots intact and woody plants greater than 2" in diameter;
- Mobilization and capture of oil with boom or sorbent material;
- Pooled oil removal.

Outcome

During the SCAT re-assessment, sheen was observed off the right descending bank southeast of the island/oxbow. SCAT re-assessment teams recommend replacing the absorbs/booms and using snares in areas of pooled oil during operations and maintenance. Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil remains on the northwestern shoreline of the island/oxbow.
- Oiled herbaceous vegetation remains on the northern shoreline of the island/oxbow.
- Oiled woody vegetation remains on right descending bank northeast of the island/oxbow.

Segment 21.5 has reached the operational endpoint for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

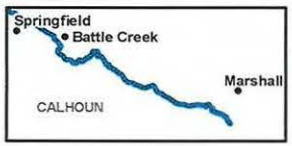
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In[illegible]t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 21.25-21.50 Left Bank While Looking Downstream										
SCD3-17	Shoreline	Shoreline Assessment	?		X	X	General vicinity consists of oiled trees and oil overhanging vegetation.	Cut and remove vegetation.	42.35098	-85.27687
SCD3-18	Shoreline	Shoreline Assessment			X		Oiled overhanging vegetation	Cut and remove branches.	42.35112	-85.27880
EPA-C-0438	Channel	SCAT T1 08/31/2010	mp 21.5					No further action required	42.35119	-85.27842





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division D: Mile Marker 21.25-21.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

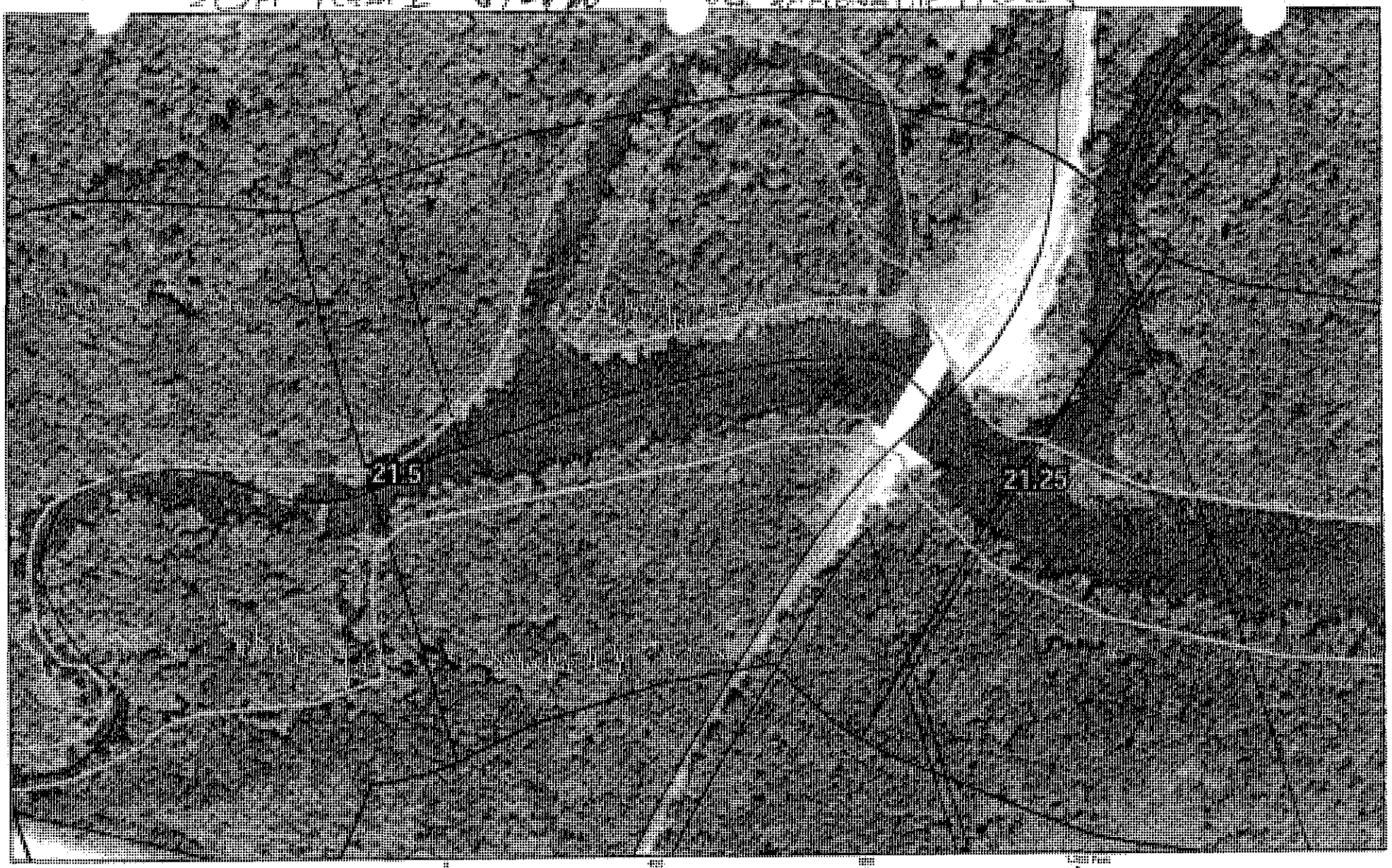
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

SCAT Team 2 8/31/10 No actionable items



21.25 to 21.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

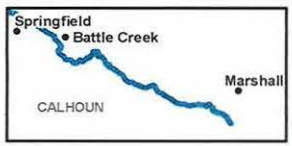
ENTRIX

Enbridge Pipeline Release I.. t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 21.25-21.50 Right Bank While Looking Downstream										
SCD3-13	Shoreline	Shoreline Assessment	X	X	X	X		Oiled vegetation overhang - cut and remove. Pooled oil at log jamp point. Snare and remove oil.	42.35207	-85.27797
SCD3-15	Shoreline	Shoreline Assessment	?					Tree rings with stained or coated oil. Wash and collect or natural remediation.	42.35217	-85.27543
SCD3-16	Shoreline	Shoreline Assessment	X			X		Oiled shoreline of small island next to bridge - dig up? High volume flush & collect to snares and dispose.	42.35138	-85.27592
EPA-C-0507	Shoreline	SCAT T2 08/30/2010	GPS taken west of Custer Rd bridge photo 592 looking downstream @milemarker 21.25 photos 593 and 594 show sheen on water in this zone assessment in this zone inclues island west of Custer Rd--see sketch for this segment					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35139	-85.27550
EPA-C-0508	Channel	SCAT T2 08/30/2010	GPS at end of 21.25 photo 595 looking upstream from MP 21. 5					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35140	-85.27898





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division D: Mile Marker 21.25-21.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

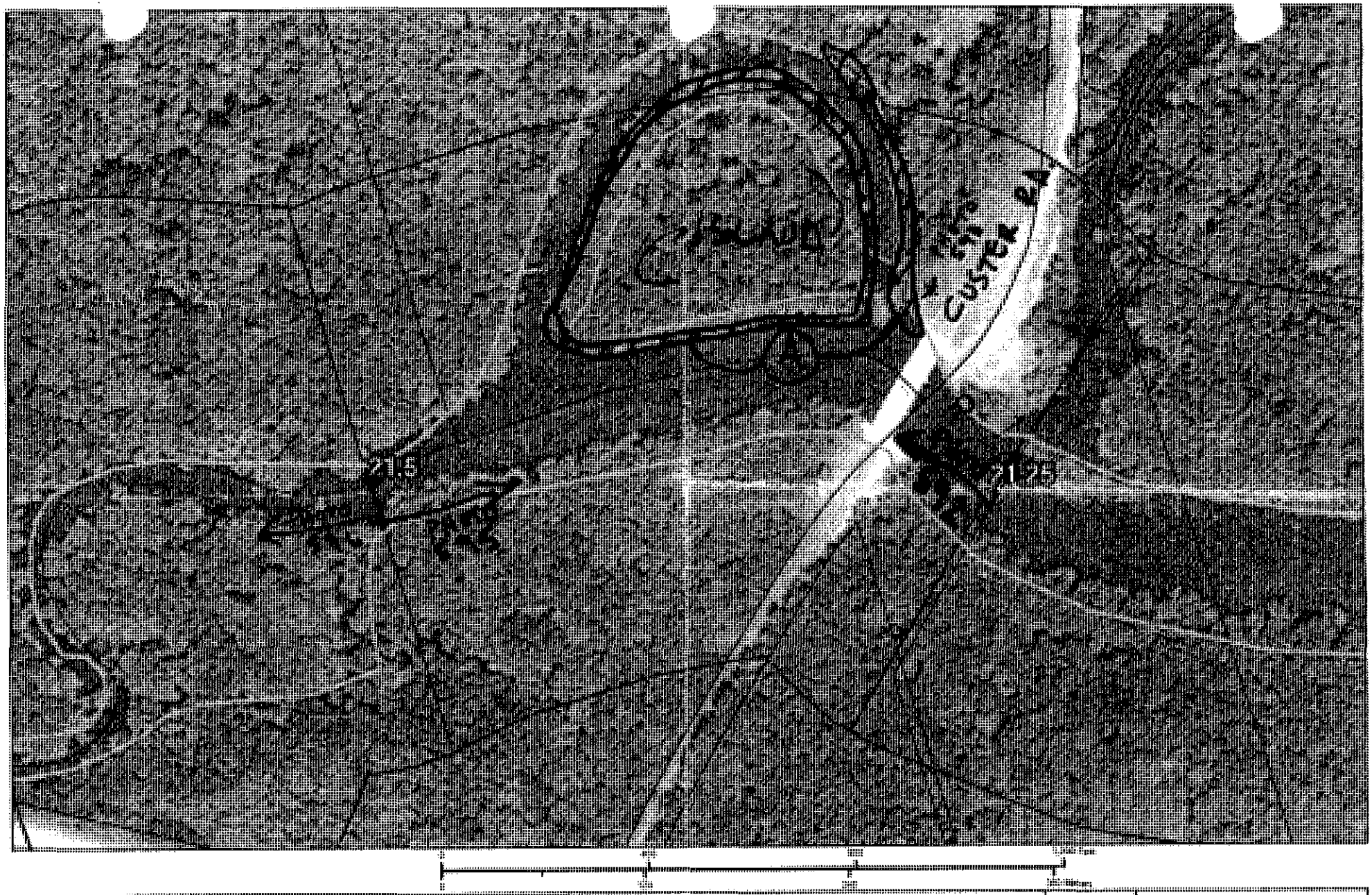
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



21.25 to 21.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

www.entrix.com

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/16/10 **Time: AM / (PM)** 4:45 pm

Operations Division: D **Segment ID: From** 21.25 **Start MP to End MP** 21.50 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☒ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Amy Ruemmler Amy Ruemmler

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected / Complete

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected / complete

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected / complete

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

All SCAT items inspected / complete

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 09/16/10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 215 **Start MP to End MP** 215 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Rain / Clouds

Field Inspection Team

[redacted]

Enbridge Inspector: [signature] Chief Div

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

Reviewed all items outlined by SCAT.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

All work complete

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 21.25-21.50 Left Bank While Looking Downstream											
SCD3-17	Shoreline	Shoreline Assessment	?		X	X	General vicinity consists of oiled trees and oil overhanging vegetation.	Cut and remove vegetation.	42.35098	-85.27687	(Y) / N
SCD3-18	Shoreline	Shoreline Assessment			X		Oiled overhanging vegetation	Cut and remove branches.	42.35112	-85.27880	(Y) / N
EPA-C-0438	Channel	SCAT T1 08/31/2010	mp 21.5					No further action required	42.35119	-85.27842	(Y) / N

Printed Team Members Names: Pamela Rice, Enbridge/NRC & [illegible] DNRE
Date: 9/18/10
Comments: Ross DEL ROSARIO, EPA

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 21.25-21.50 Right Bank While Looking Downstream											
SCD3-13	Shoreline	Shoreline Assessment	X	X	X	X		Oiled vegetation overhang - cut and remove. Pooled oil at log jamp point. Snare and remove oil.	42.35207	-85.27797	(Y) / N
SCD3-15	Shoreline	Shoreline Assessment	?					Tree rings with stained or coated oil. Wash and collect or natural remediation.	42.35217	-85.27543	(Y) / N
SCD3-16	Shoreline	Shoreline Assessment	X			X		Oiled shoreline of small island next to bridge - dig up? High volume flush & collect to snares and dispose.	42.35138	-85.27592	(Y) / N
EPA-C-0507	Shoreline	SCAT T2 08/30/2010	GPS taken west of Custer Rd bridge photo 592 looking downstream @milemarker 21.25 photos 593 and 594 show sheen on water in this zone assessment in this zone inclues island west of Custer Rd--see sketch for this segment					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35139	-85.27550	(Y) / N
EPA-C-0508	Channel	SCAT T2 08/30/2010	GPS at end of 21.25 photo 595 looking upstream from MP 21. 5					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35140	-85.27898	(Y) / N

Printed Team Members Names: Pamela Rice, Enbridge/NRG; ROSE DEL ROSARIO, EPA; MATT WESENER, DNRE
Date: 9/18/10
Comments:
See below and backside of sheet.

SCD3-14 Shoreline NA No Comment No Recommendation ~~SEE NOTES~~ 42.352817 -85.27595 Y / N

or back of sheet.

EPA - [illegible] - Sheen, still obs[illegible] in narrowest part of this short zone.
Abo[illegible] t[illegible] [illegible] [illegible] [

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: 1 **Segment ID: From** 21 25 **Start MP to End MP** 21 50 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature (date) 9-17-2010 Enbridge

Signature Eugene Dennis, EPA OSC (date) 9-17-2010 EPA

4. **SCAT Reassessment**

Signature (date) 9/18/10 Enbridge
Pamela E. Rice

Signature (date) 9/18/10 EPA
ROSS DEL ROSARIO

Signature (date) 9/18/10 MDNRE
MATTHEW D WESENER

5. **EPA**

Signature (date) 9/22/10 EPA Division Supervisor
GARY LIPSON

Appendix E
Photographs

Field Photo Log – Segment 21.5



Photo 0451 – Facing north at island/oxbow near SCD3-16.



Photo 0452 – Facing west at island/oxbow.

Field Photo Log – Segment 21.5



Photo 0453 – Facing north at island/oxbow near SCD3-13.



Photo 0455 – Facing north at island/oxbow near EPA-D-004.

Field Photo Log – Segment 21.5



Photo – 0457 – Facing east at island/oxbow.



Photo – 0458 – Facing north at island/oxbow near SCD3-14.

Field Photo Log – Segment 21.5



Photo 0459 – Facing south at island/oxbow.



Photo 0461 – Facing east at right descending bank near SCD3-15.

Field Photo Log – Segment 21.5



Photo 0462 – Facing south at right descending bank near EPA-C-0507.



Photo 0464 – Facing southwest at island/oxbow near EPA-D-0003.

Field Photo Log – Segment 21.5

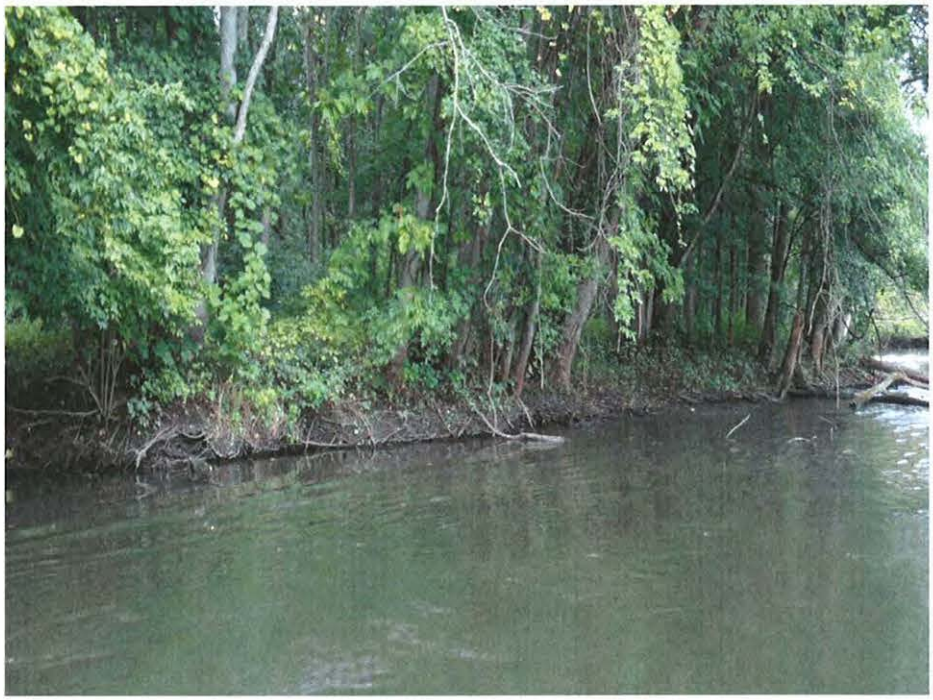


Photo 0465 – Facing north at right descending bank.



Photo 0466 – Facing south at left descending bank near EPA-C-0438/SCD3-18.

Field Photo Log – Segment 21.5



Photo 0467 – Facing southeast at left descending bank.



Photo 0468 – Facing southeast at left descending bank near SCD3-17.

Field Photo Log – Segment 21.5



Photo 0469 – Facing southeast at left descending bank.



Photo 0470 – Facing northeast at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 21.75 – MP 21.50 to 21.75

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 21.75 had very light oiling on the left descending bank and very light oiling on the right descending bank with oiled debris on both banks. The overbank areas contained oiled debris and vegetation on the right descending bank side and weathered patches of oil on the left descending bank side. Islands were absent and there were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 21.75 consisted of the following:

- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris
- Removal of overhanging limbs
- Removal of oiled vegetation leaving roots intact.
- Removal of woody vegetation less than 2" in diameter

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled debris along right descending bank in SCAT Zones A and B
- Multiple weathered oil patches (oiled soil) and oil debris in left overbank near SCAT zone A.

Segment 21.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

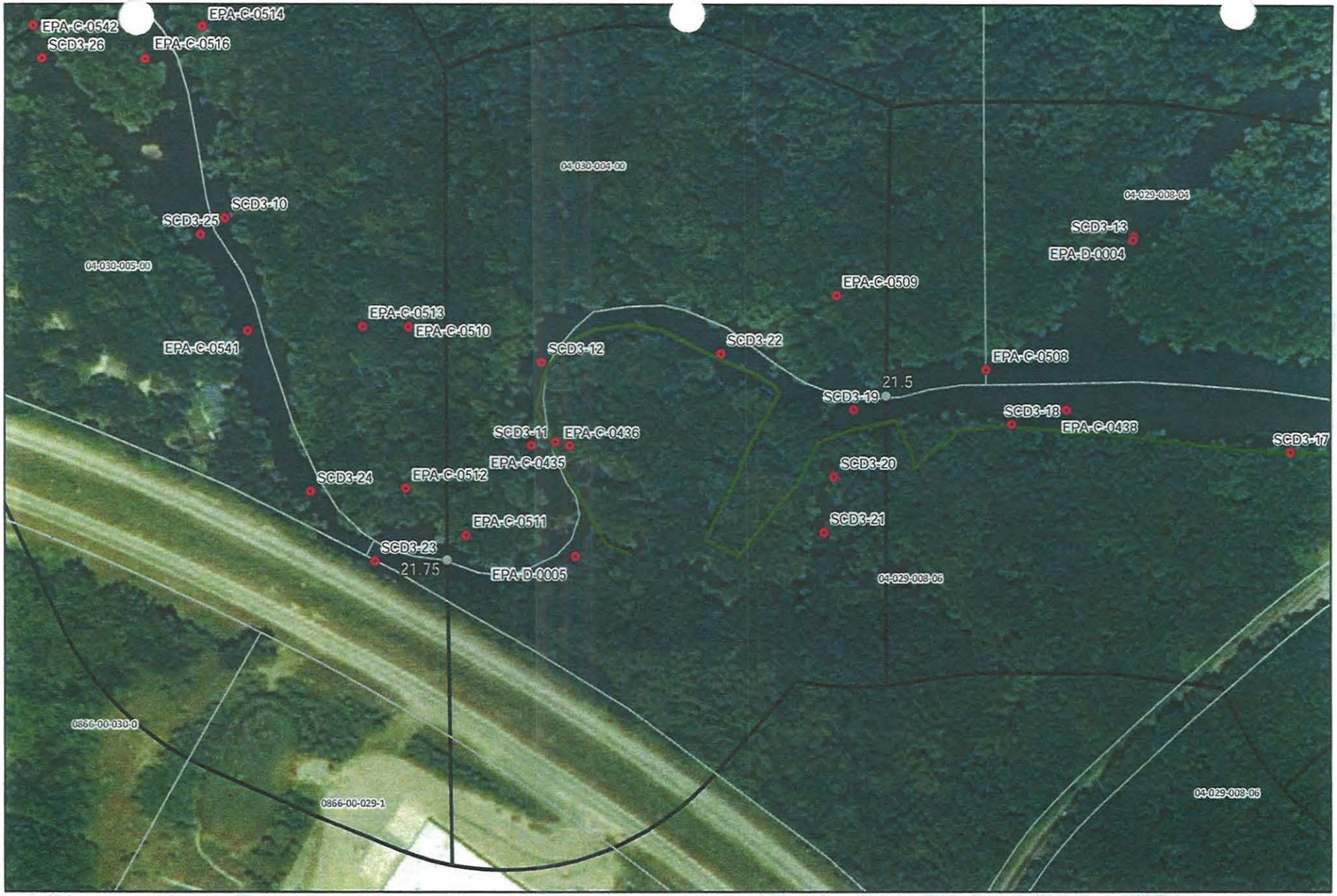
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

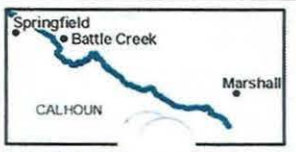
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 21.5-21.75 Left Bank While Looking Downstream										
EPA-C-0435	Overbank	SCAT T1 08/31/2010	patches of weathered					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35098	-85.28188
EPA-C-0436	Channel	SCAT T1 08/31/2010	end of zone A					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35100	-85.28198
SCD3-19	Shoreline	Shoreline Assessment			X	X		Oiled debris pile on bank at headpoint of river separation point - remove debris.	42.35118	-85.27990
SCD3-20	Shoreline	Shoreline Assessment			X	X		Oiled debris pile on bank at headpoint of river separation point - remove debris.	42.35083	-85.28003
SCD3-21	Shoreline	Shoreline Assessment	X		X	X		Oil debris pile and tar along logs/water. Suggest further investigation in inlet further upstream into inlet.	42.35055	-85.28010
SCD3-22	Shoreline	Shoreline Assessment	X			X		Debris field at log jam. Remove debris. Collect oil with snares.	42.35147	-85.28083





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 21.5-21.75
Left Bank While Looking Downstream

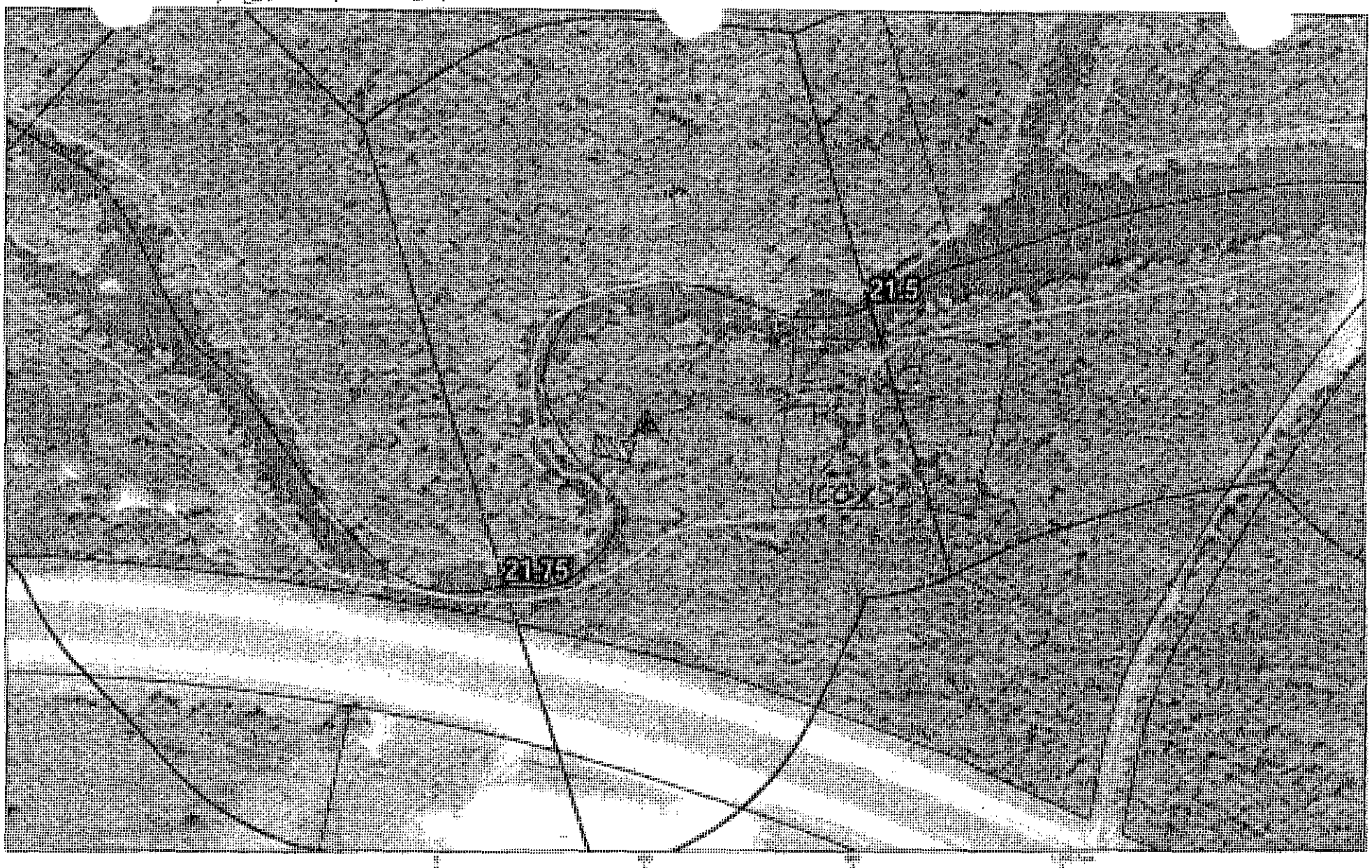
Enbridge Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane South Feet



Centerline/Markers
Parcels_1000ftBuffer
Shoreline
River_Centerlines
Divisions

21.5 to 21.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2008 NAIP

SHEET # 48

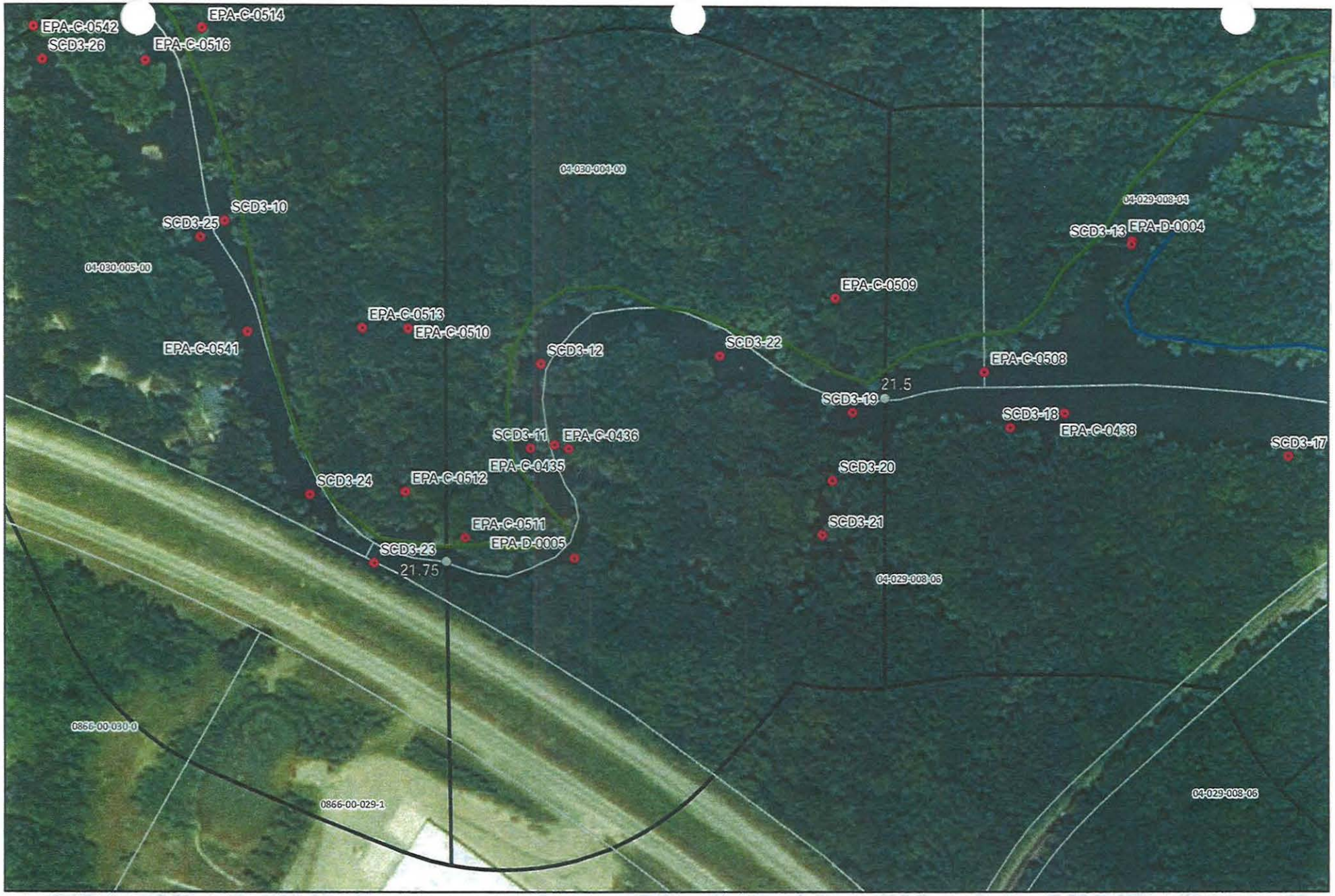
ENTRIX
Down to Earth, Down to Business

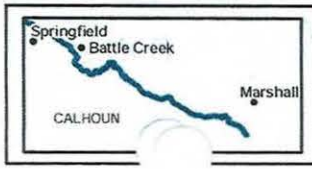
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 21.5-21.75 Right Bank While Looking Downstream										
EPA-C-0510	Overbank	SCAT T2 08/30/2010	photo 599 shows oiled debris where GPS taken					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35159	-85.28301
EPA-C-0509	Overbank	SCAT T2 08/30/2010	photo 596 looking downstream at milepost 21.5 photo 598 shows oiled vegetation					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35177	-85.28003
EPA-C-0511	Channel	SCAT T2 08/30/2010	GPS @ mile marker 21.75 photo 600 looking upstream from milemarker 21.75					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35052	-85.28260
SCD3-11	Shoreline	Shoreline Assessment			X	X		Oil on fallen tree leaves and limbs - cut and remove.	42.35098	-85.28215
SCD3-12	Shoreline	Shoreline Assessment	X	X		X		Debris field with pooled oil. Volume flush, and collect with snare and dispose.	42.35142	-85.28208





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 21.5-21.75
Right Bank While Looking Downstream

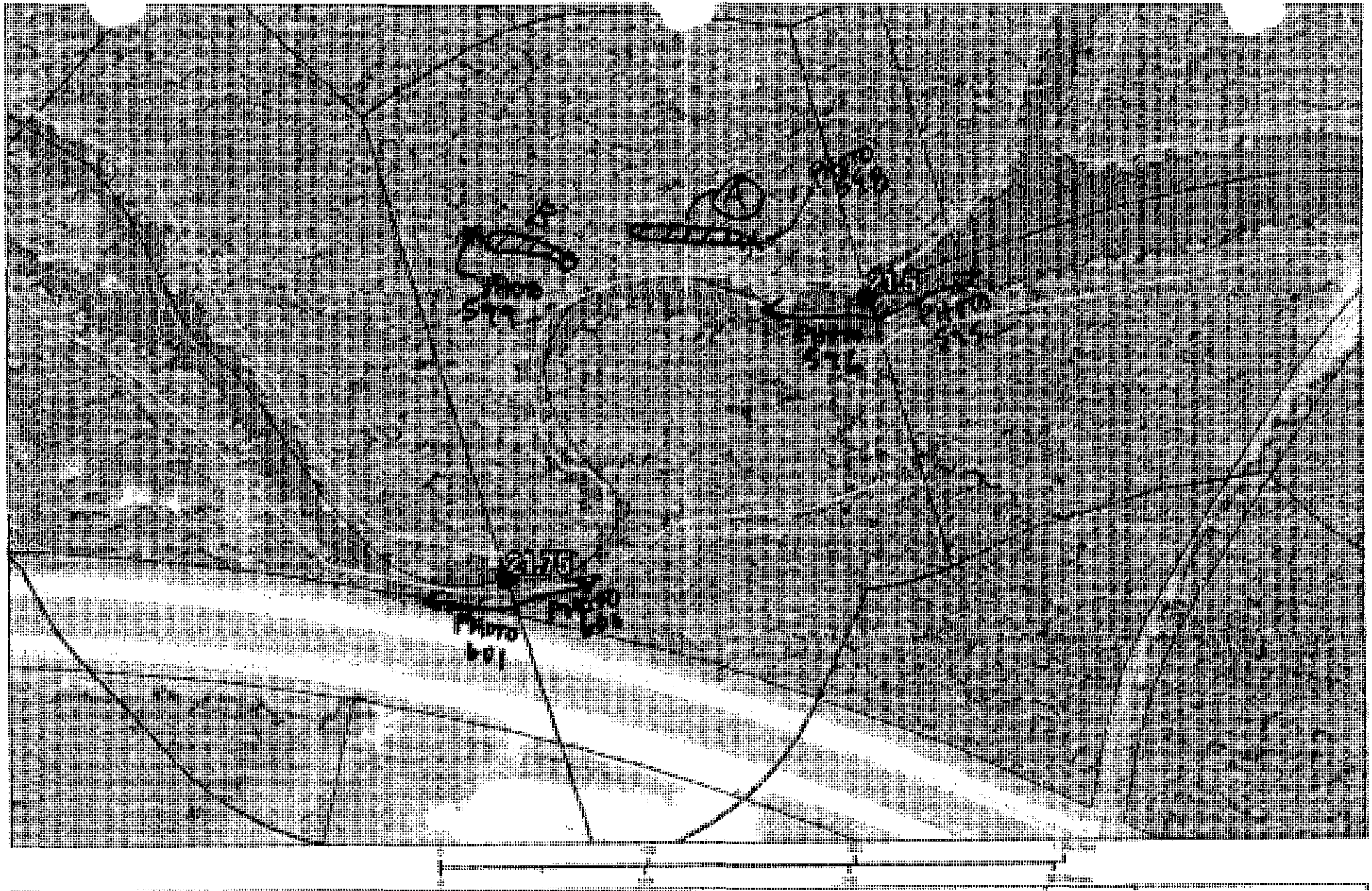
Enbridge Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane South Feet



21.5 to 21.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 7-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 21.5 Start MP to End MP 21.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 76°F

Field Inspection Team

Enbridge Inspector: [signature] Doug Deren

Division Supervisor(Contractor): [signature] Steve Turner

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

Revised9/01/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-10 **Time: AM / PM**

Operations Division: 7D **Segment ID: From** 21.5 **Start MP to End MP** 21.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 9 areas of concern from the SCAT report
Clean up required is flushing, Pooling, Vegt debris removed and over hanging Limbs

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 9 areas of concern from the SCAT report
Clean up is Complete according to the recommendations from SCAT

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - K... ...azoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 21.5-21.75 Left Bank While Looking Downstream											
EPA-C-0435	Overbank	SCAT T1 08/31/2010	patches of weathered					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35098	-85.28188	Y / N
EPA-C-0436	Channel	SCAT T1 08/31/2010	end of zone A					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35100	-85.28198	Y / N
SCD3-19	Shoreline	Shoreline Assessment			X	X		Oiled debris pile on bank at headpoint of river separation point - remove debris.	42.35118	-85.27990	Y / N
SCD3-20	Shoreline	Shoreline Assessment			X	X		Oiled debris pile on bank at headpoint of river separation point - remove debris.	42.35083	-85.28003	Y / N
SCD3-21	Shoreline	Shoreline Assessment	X		X	X		Oil debris pile and tar along logs/water. Suggest further investigation in inlet further upstream into inlet.	42.35055	-85.28010	Y / N
SCD3-22	Shoreline	Shoreline Assessment	X			X		Debris field at log jam. Remove debris. Collect oil with snares.	42.35147	-85.28083	Y / N

Printed Team Members Names:
Date:
Comments:

Additional area - multiple weathered oil patches oiled debris 100 X 50 42.213 -85.1652 min, degrees, sec.
rec. clean-up, scrape oiled sand
- unsure is the same as zone A
area flagged w/red tape
did not wanted a call to ops.

→ assuming this is the issue we found

9/8/10
Team 4
Amanda Bohnebl...
Ernest Surlepts
Jose Negrin

→ flagged as one location in the field

Enbridge Pipeline Release Incident - K[illegible]azoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 21.5-21.75 Right Bank While Looking Downstream											
EPA-C-0510	Overbank	SCAT T2 08/30/2010	photo 599 shows oiled debris where GPS taken					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35159	-85.28301	Y / N
EPA-C-0509	Overbank	SCAT T2 08/30/2010	photo 596 looking downstream at milepost 21.5 photo 598 shows oiled vegetation					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35177	-85.28003	Y / N
EPA-C-0511	Channel	SCAT T2 08/30/2010	GPS @ mile marker 21.75 photo 600 looking upstream from milemarker 21.75					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35052	-85.28260	Y / N
SCD3-11	Shoreline	Shoreline Assessment			X	X		Oil on fallen tree leaves and limbs - cut and remove.	42.35098	-85.28215	Y / N
SCD3-12	Shoreline	Shoreline Assessment	X	X		X		Debris field with pooled oil. Volume flush, and collect with snare and dispose.	42.35142	-85.28208	Y / N

Printed Team Members Names:
Date:
Comments:

not a zone, nothing to sign off on

zones A & B still contained some oiled debris, hover, ~~we [illegible]~~ no recommendation zone cleared by res[illegible]

9/8/10
Team 4
Amanda Bohnke
Ernest Surlepts
Jose Negron

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 21.50 **to MP** 21.75 **Segment Length: 0.25 mile**

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature	(date)	
Ken Cortley	07-Sept-2010	Enbridge
Stephen Ball	9/7/10	EPA

4. **SCAT Reassessment**

Signature	(date)		
Jack W. Boss	9/9/10	Enbridge	Amanda Bohnenblust 9/9/
WILLIAM J BATES	9/9/10	EPA	HOWARD PREAM 9/9/1
James Sallee	9/9/10	MDNRE	Ernest Sarkipato 9/

5. **EPA**

Signature	(date)	
GARY LIPSON	9/16/10	EPA Division Supervisor

Appendix E
Photos



Photo 0302 – Looking southwest at right descending bank (overbank). Near EPA-C-0509.



Photo 0303 – Looking west at left descending bank. Near SCD3-21.



Photo 0304 – Looking north at left descending bank. Near SCD3-20.



Photo 0305 – Looking southeat at left descending bank.



Photo 0306 – Looking north at right descending bank. Near EPA-C-0509.



Photo 0307 – Looking southeast at left descending bank. Near SCD3-22.



Photo 0308 – Looking south at right descending bank..



Photo 0309 – Looking east at left descending bank. Near EPA-C-0435.

Field Photo Log – Segment MP 21.75



Photo 0310 – Looking west at right descending bank. Near SCD3-12.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 22.00 – MP 21.75 to 22.00

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 22.00 had very light oiling on the left and right descending bank including areas of oiled overhanging vegetation and oiled debris. Some pooling of oil behind oiled debris was observed on the left descending bank. An island present had very light shoreline oiling and some oiled debris. The overbank areas contained no areas of oil requiring clean-up. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions. The clean-up activities within Segment 22.00 consisted of the following:

- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of overhanging limbs
- Removal of oiled debris
- Woody vegetation less than 2" in diameter removed
- Removal of oiled vegetation leaving roots intact up to 10' from waterline

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody vegetation in the right overbank area and on the right and left descending banks (near MP 21.75 and 22 respectively)

Segment 22.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

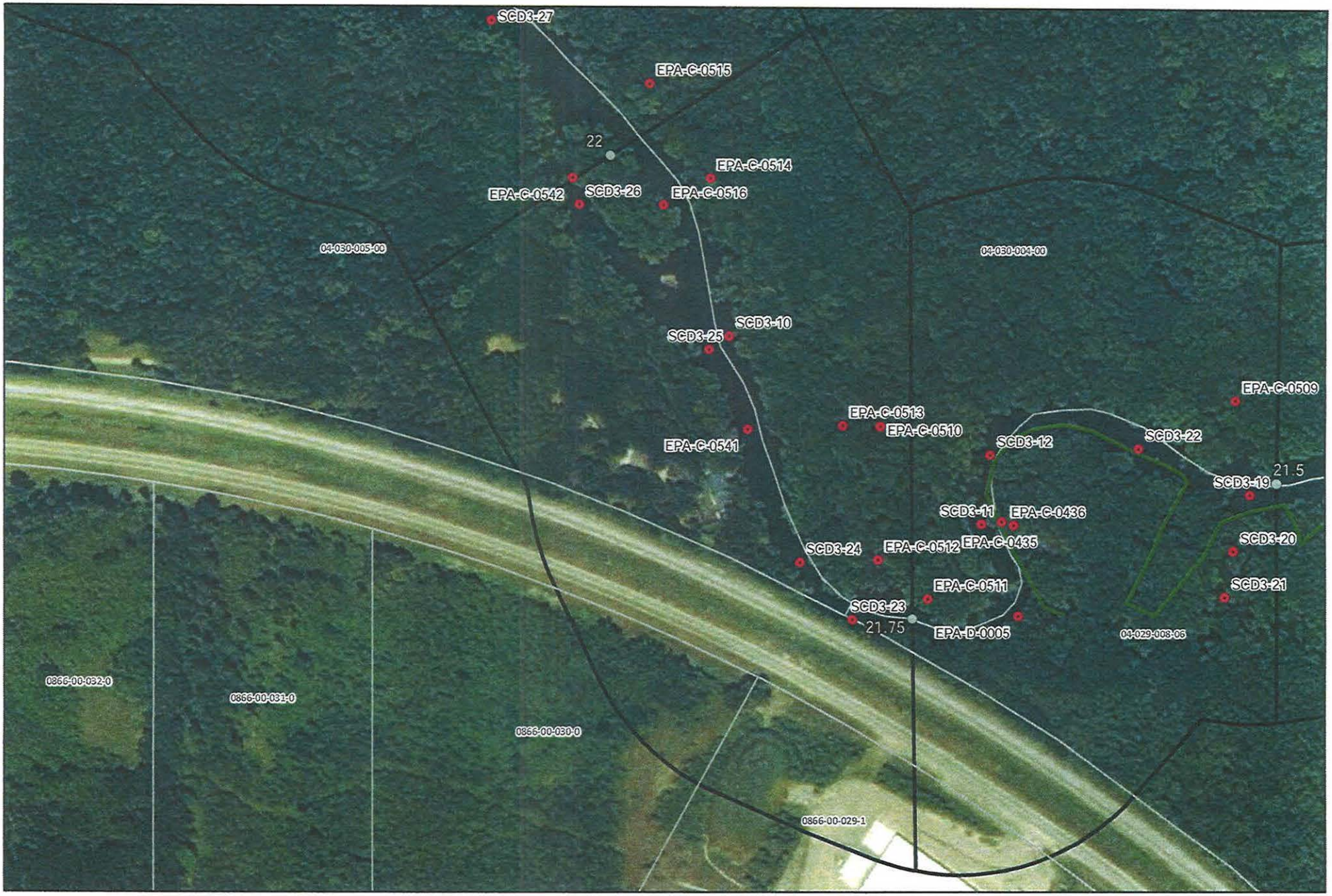
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

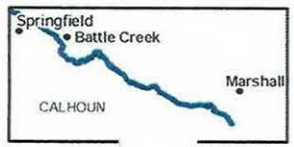
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 21.75-22.0 Left Bank While Looking Downstream										
EPA-C-0542	Shoreline	SCAT T4 08/29/2010	5-10 patches of tar					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35312	-85.28565
EPA-C-0541	Shoreline	SCAT T4 08/29/2010	Photo 19 facing downstream					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35156	-85.28413
SCD3-23	Shoreline	Shoreline Assessment			X			Oiled overhanging vegetation - cut and remove.	42.35038	-85.28323
SCD3-24	Shoreline	Shoreline Assessment			X			Oiled overhanging vegetation - cut and remove.	42.35073	-85.28368
SCD3-25	Shoreline	Shoreline Assessment	X		X	X		Oiled shore edge (2"). Flush and collect. Overhanging vegetatioin is oiled - cut and remove.	42.35205	-85.28447
SCD3-26	Shoreline	Shoreline Assessment	X	X		X		Oil pooled behind trees and debris in water. Snare and dispose oil.	42.35295	-85.28558





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 21.75-22
Left Bank While Looking Downstream

Enbridge *Release Incident - Kalamazoo River Oil Spill*

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

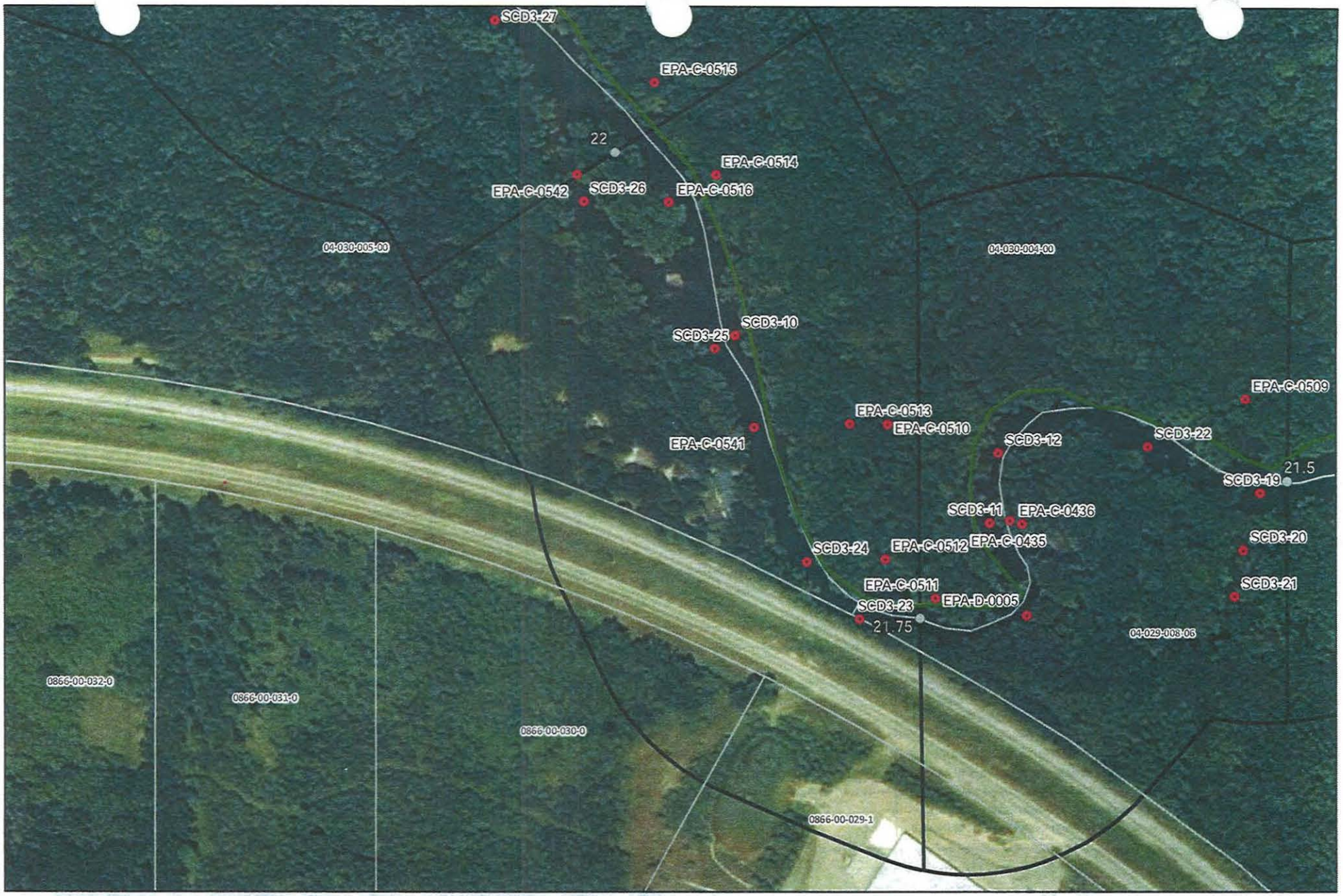
ENTRIX
www.entrix.com

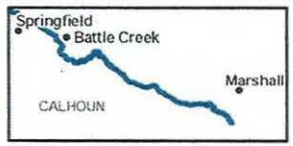
Co... tem: NAD 1983 State
Pl... South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 21.75-22.0 Right Bank While Looking Downstream										
EPA-C-0515	Channel	SCAT T2 08/30/2010	photo # 604 looking upstream from MP 22.0; sketch for this segment includes island					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35371	-85.28500
EPA-C-0512	Overbank	SCAT T2 08/30/2010	photo 601 looking upstream from milepost 21.75 photo 602 shows oiled debris ; sketch for this segment includes island					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35075	-85.28302
EPA-C-0513	Shoreline	SCAT T2 08/30/2010	sketch for this segment includes island					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35159	-85.28333
EPA-C-0514	Shoreline	SCAT T2 08/30/2010	sketch for this segment includes island					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35312	-85.28448
SCD3-10	Shoreline	Shoreline Assessment			X	X		Oiled wood debris - remove. Some oiled overhang veg - cut and remove.	42.35213	-85.28430





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C Mile Marker 21.75-22
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

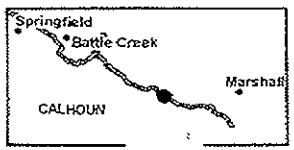
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division C: Mile Marker 5.75 - 8.0
Left Bank While Looking Downstream

Enbridge [illegible] Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

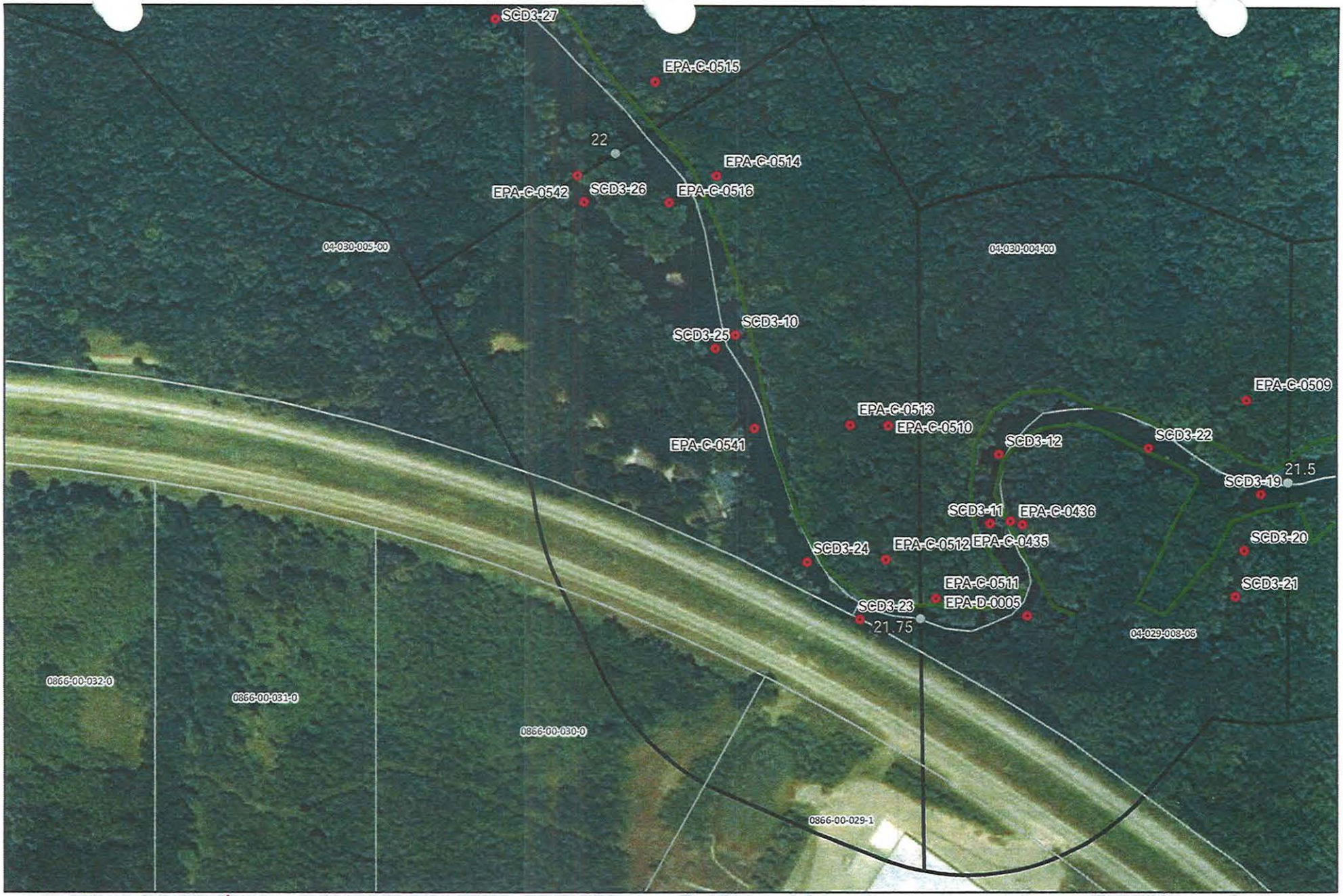
Source: Aerial Photography: USDA, 2010.

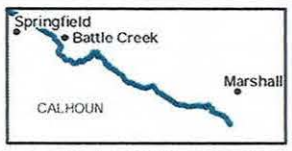
ENTRIX
www.entrix.com

Coor
Pla
Item: NAD 1983 State
South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 21.75-22.0 Island										
EPA-C-0516	Shoreline	SCAT T1 08/28/2010	photo 605 looking upstream at island GPS taken at one of the oiled debris pile see sketch of island in sketch for segment 22.0; see sketch of island in sketch for segment 22.0					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35295	-85.28487





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division D: Mile Marker 21.75-22 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

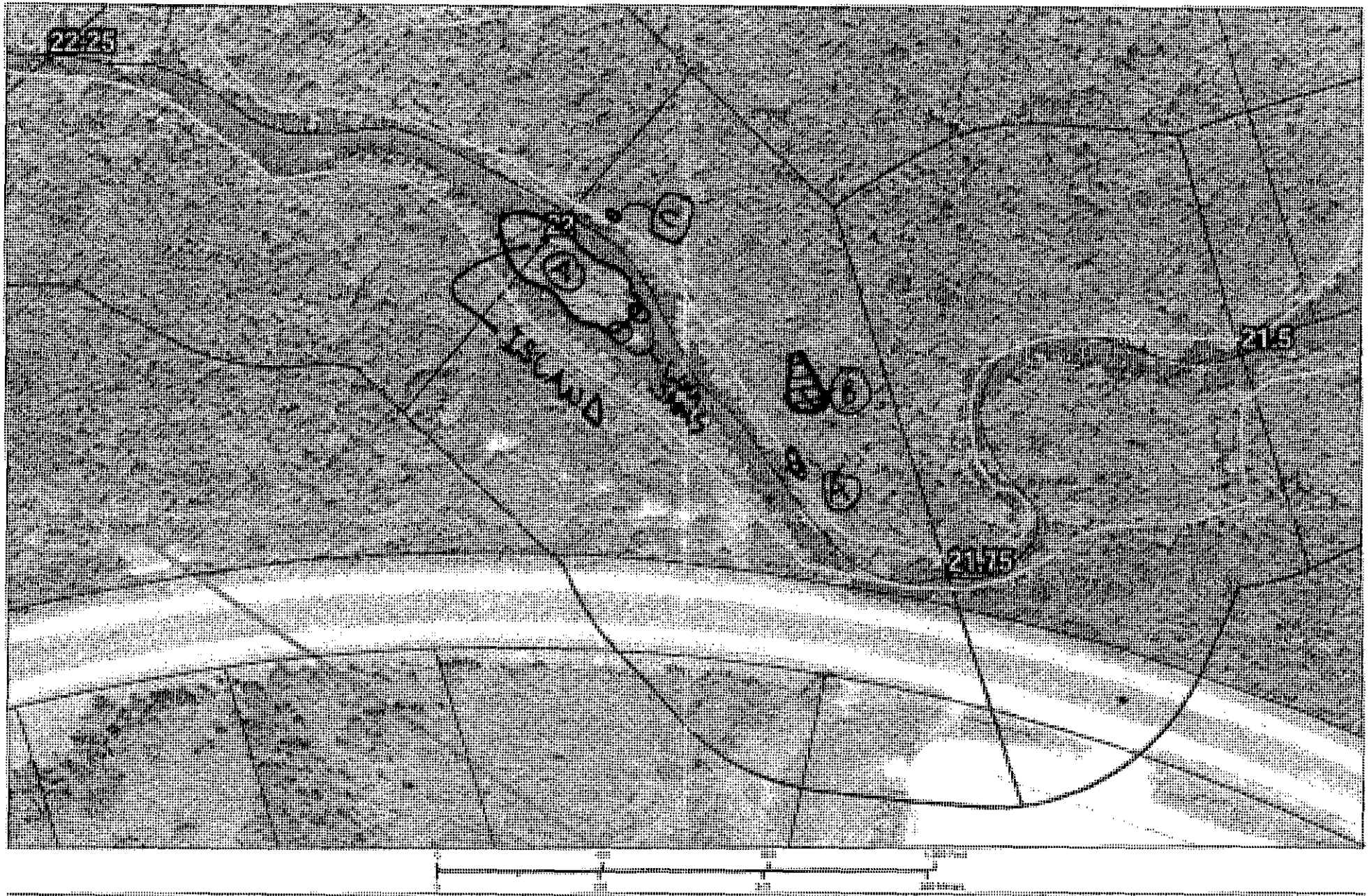
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



21.75 to 22

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 7 Sept 10 Time: AM / PM

Operations Division: D Segment ID: From 21.75 Start MP to End MP 22.0 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Doug Deren

Division Supervisor(Contractor): STEVE TUCKER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green

Island

~~LOB~~ – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT point marked green

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7 **Time: AM / PM**

Operations Division: D **Segment ID: From** 21.75 **Start MP to End MP** 22.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 9 areas of concern from the SCAT report.
Clean up required is flushing, pooling, veg + debris removal and overhanging limbs

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 9 areas of concern from the SCAT report.
Clean up is complete according to the

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 21.75-22.0 Left Bank While Looking Downstream											
EPA-C-0542	Shoreline	SCAT T4 08/29/2010	5-10 patches of tar					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35312	-85.28565	(Y) / N
EPA-C-0541	Shoreline	SCAT T4 08/29/2010	Photo 19 facing downstream ✓					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35156	-85.28413	(Y) / N
SCD3-23	Shoreline	Shoreline Assessment			X			Oiled overhanging vegetation - cut and remove.	42.35038	-85.28323	(Y) / N
SCD3-24	Shoreline	Shoreline Assessment			X			Oiled overhanging vegetation - cut and remove.	42.35073	-85.28368	(Y) / N
SCD3-25	Shoreline	Shoreline Assessment	X		X	X		Oiled shore edge (2"). Flush and collect. Overhanging vegetatioin is oiled - cut and remove.	42.35205	-85.28447	(Y) / N
SCD3-26	Shoreline	Shoreline Assessment	X	X		X		Oil pooled behind trees and debris in water. Snare and dispose oil.	42.35295	-85.28558	(Y) / N

Printed Team Members Names:
Date:
Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 21.75-22.0 Right Bank While Looking Downstream											
EPA-C-0515	Channel	SCAT T2 08/30/2010	photo # 604 looking upstream from MP 22.0; sketch for this segment includes island					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35371	-85.28500	(Y) / N
EPA-C-0512	Overbank	SCAT T2 08/30/2010	photo 601 looking upstream from milepost 21.75 photo 602 shows oiled debris ; sketch for this segment includes island					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35075	-85.28302	(Y) / N
EPA-C-0513	Shoreline	SCAT T2 08/30/2010	sketch for this segment includes island					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35159	-85.28333	(Y) / N
EPA-C-0514	Shoreline	SCAT T2 08/30/2010	sketch for this segment includes island					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35312	-85.28448	(Y) / N
SCD3-10	Shoreline	Shoreline Assessment			X	X		Oiled wood debris - remove. Some oiled overhang veg - cut and remove.	42.35213	-85.28430	(Y) / N

Printed Team Members Names:
Date:
Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 21.75-22.0 Island											
EPA-C-0516	Shoreline	SCAT T1 08/28/2010	photo 605 looking upstream at island GPS taken at one of the oiled debris pile see sketch of island in sketch for segment 22.0; see sketch of island in sketch for segment 22.0					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35295	-85.28487	(Y) / N

Printed Team Members Names:
Date:
Comments:

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: 1 **Segment ID: From MP** 21.75 **to MP** 22.00 **Segment Length: 0.25 mile**

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

08-Sept-2010 Enbridge
Signature Ken Costley (date)

9-8-10 EPA
Signature Gary A. Anderson (date)

4. **SCAT Reassessment**

Enbridge
Signature (date)

EPA
Signature (date)

MDNRE
Signature (date)

See Separate form

5. **EPA**

EPA Division Supervisor
Signature (date)

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: D **Segment ID: From** 214.75 **Start MP to End MP** 220 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection** See separate Form

Signature (date) Enbridge

Signature (date) EPA

4. **SCAT Reassessment**

Glenn Vorderwate 9/8/10
Signature Glenn Vorderwate (date) Enbridge

Christine R. Jump 9/8/10
Signature Christine R. Jump (date) EPA

Kenneth M. Mraczkowski 09/08/2010
Signature (date) MDNRE
Kenneth M. Mraczkowski

was signed by all three representativ after the Step 3 inspect

5. **EPA**

Gary Logsdon 9/16/10
Signature (date) EPA Division Supervisor
GARY LIPSOD

Appendix E
Photos



Photo 0139 – Looking southwest at right descending bank (overbank). Near EPA-C-0510.



Photo 0140 – Looking west at right descending bank (overbank). Near EPA-C-0513.



Photo0141 – Looking west at right descending bank (overbank). Near EPA-C-0512.



Photo 0142 – Looking northwest at left descending bank. Near SCD3-23.



Photo 0143 – Looking southeast at left descending bank.



Photo 0144 – Looking southeast at left descending bank. Near SCD3-24.



Photo 0145 – Looking west at left descending bank. Near SCD3-25.



Photo 0146 – Looking southwest at left descending bank. Near EPA-C-0542.



Photo 0147 – Looking west at left descending bank. Near SCD3-26.



Photo 0148 – Looking east at island shoreline.



Photo 0149 – Looking south at island shoreline. Near EPA-C-0516.



Photo 0150 – Looking west at island shoreline.



Photo 0151 – Looking northwest at island shoreline.



Photo 0152 – Looking east at right descending bank. Near EPA-C-0510.



Photo 0153 – Looking southeast at right descending bank. Near EPA-C-0513.



Photo 0154 – Looking southeast at right descending bank. Near SCD3-10.



Photo 0155 – Looking northeast at right descending bank. Near EPA-C-0514.



Photo 0156 – Looking northeast at right descending bank (overbank). Near EPA-C-0514.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 22.25 – MP 22.0 to 22.25

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 22.25 had oiling conditions including oiled overhanging vegetation and an oiled debris field on the left descending bank; and very light oiling including tar patties, oiled debris and oiled overhanging vegetation on the right descending bank. The right descending overbank had two areas with oiling conditions, including oiled vegetation, pooled oil and oiled debris. Islands were absent (island visible on aerial photo is addressed in upstream segment). There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 22.25 consisted of the following:

- Removal of woody vegetation less than 2" in diameter
- Removal of oiled vegetation leaving roots intact.
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris
- Removal of overhanging limbs

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oil stained trees on right descending overbank

Segment 22.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

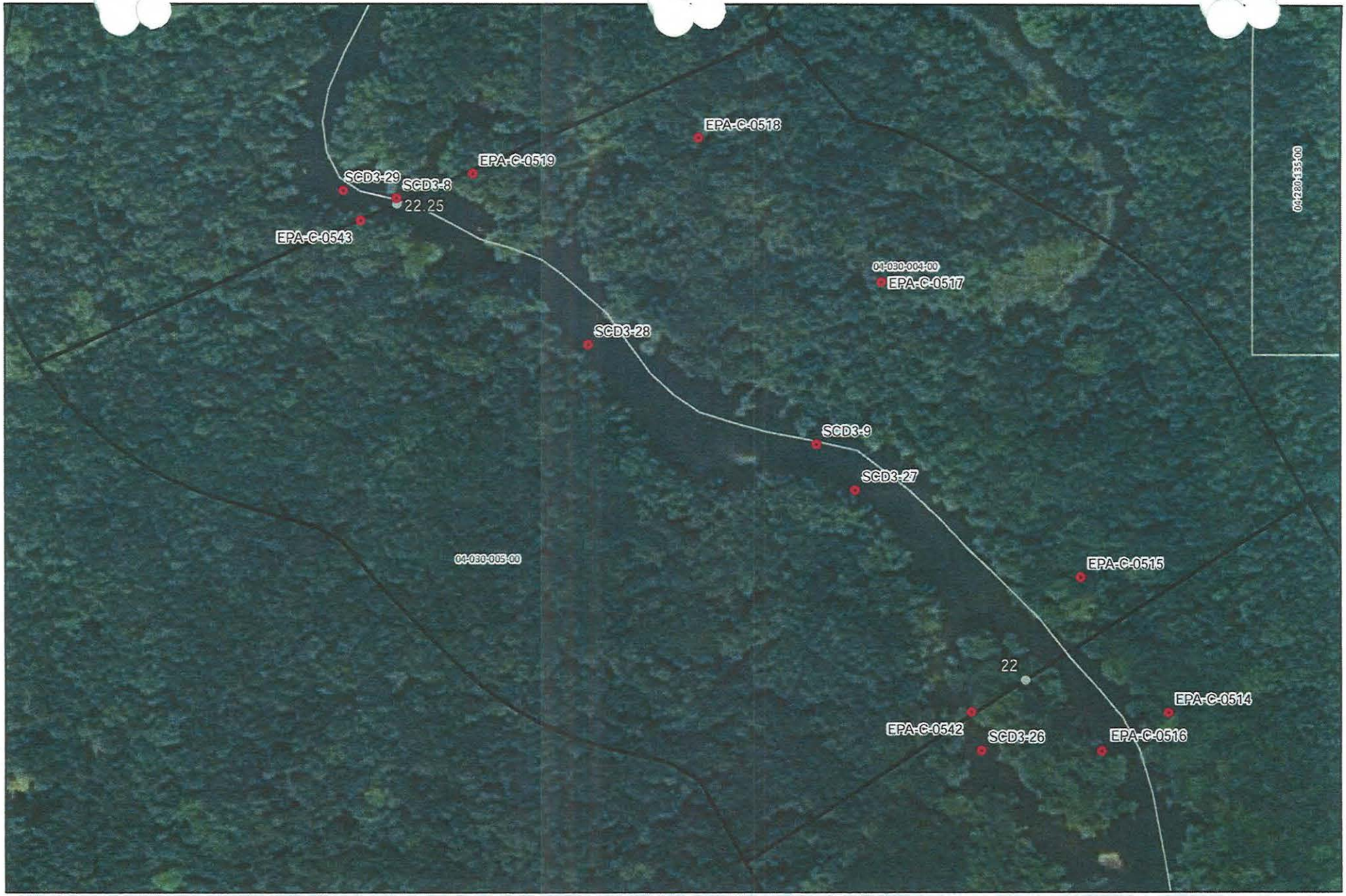
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

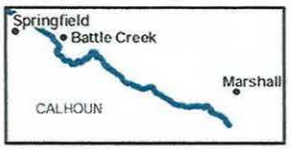
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 22.0-22.25 Left Bank While Looking Downstream										
EPA-C-0507	Shoreline	SCAT T4 08/29/10	5-10 patches of tar					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35312	-85.28565
EPA-C-0508	Shoreline	SCAT T4 08/29/10	Photo 20 facing downstream					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35525	-85.28931
EPA-C-0543	Shoreline	SCAT T4 08/29/2010	Photo 20 facing downstream					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35525	-85.28931
SCD3-27	Shoreline	Shoreline Assessment			X			Oiled overhanging vegetation. Cut and remove.	42.35408	-85.28635
SCD3-28	Shoreline	Shoreline Assessment	X		X	X		Oiled debris field. High volume wash and collect, or snare and remove oil.	42.35472	-85.28795





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 22-22.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

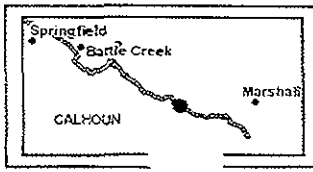
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





River Quarter Miles
Shoreline Cleanup Locations
Pooled Oil
Quarter Mile Segment

Shoreline Oiling Category
Heavy
Light
Moderate
Very Light

Division 3: Mile Marker 5.75 - 6.0
Left Bank While Looking Downstream

Enbridge P[illegible] Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

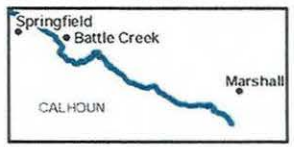
Source: Aerial Photography: USDA, 2010.

ENTRIX
www.entrix.com
Coord[illegible] System: NAD 1983 State Plan [illegible] South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 22.0-22.25 Right Bank While Looking Downstream										
EPA-C-0517	Overbank	SCAT T2 08/30/2010	photo #603 is looking downstream from MP 22.0					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35501	-85.28621
EPA-C-0518	Shoreline	SCAT T2 08/30/2010						Remove tar patties; oiled debris in logjam in drainage area	42.35563	-85.28731
EPA-C-0519	Channel	SCAT T2 08/30/2010	end of segment 22.25 photo # 611 looking upstream from mp 22.25					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35548	-85.28865
SCD3-9	Shoreline	Shoreline Assessment				X		Oiled vegetation overhang. Cut and remove	42.35428	-85.28658





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

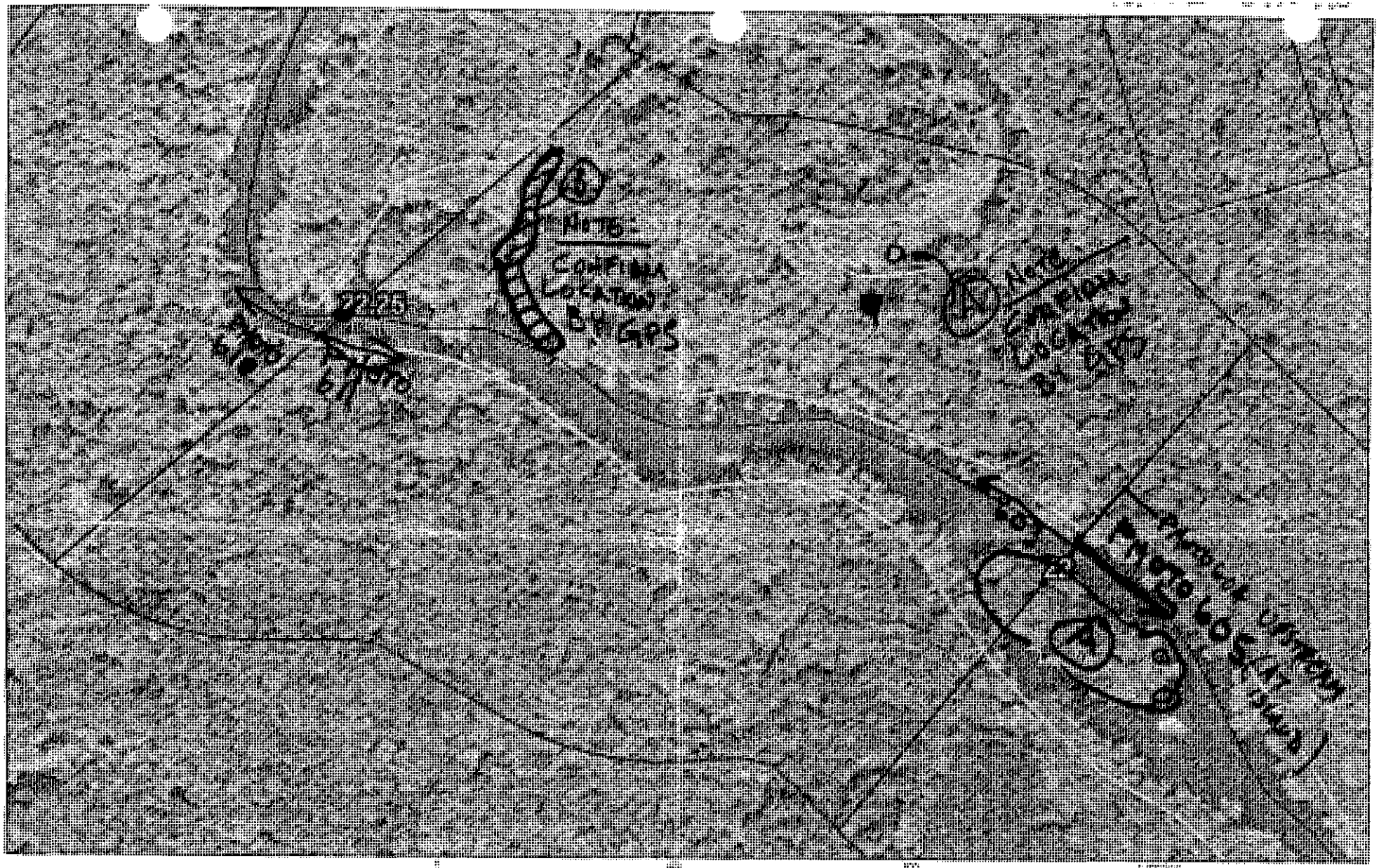
Division C: Mile Marker 22-22.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



22 to 22.25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

www.entrix.com

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 1 Sept 10 Time: AM / PM

Operations Division: D Segment ID: From 220 Start MP to End MP 220.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

Enbridge Inspector: BLRQ

Division Supervisor(Contractor): STO 2 STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 22.0 **Start MP to End MP** 22.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 4 areas of concern from the SCAT report.
Clean up required is flushing, veg. & debris removal, and overhanging limbs

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 4 areas of concern from the SCAT report
Clean up is complete accordance to the SCAT recommendations

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 22.0-22.25 Left Bank While Looking Downstream											
EPA-C-0507	Shoreline	SCAT T4 08/29/10	5-10 patches of tar					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35312	-85.28565	/ N
EPA-C-0508	Shoreline	SCAT T4 08/29/10	Photo 20 facing downstream					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35525	-85.28931	/ N
EPA-C-0543	Shoreline	SCAT T4 08/29/2010	Photo 20 facing downstream					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35525	-85.28931	/ N
SCD3-27	Shoreline	Shoreline Assessment			X			Oiled overhanging vegetation. Cut and remove.	42.35408	-85.28635	/ N
SCD3-28	Shoreline	Shoreline Assessment	X		X	X		Oiled debris field. High volume wash and collect, or snare and remove oil.	42.35472	-85.28795	/ N

Printed Team Members Names: BILL BATES, EPA
Date: 9/9/10
Comments:

JACK BOSS
JAMES SALLEE
HOWARD PHAM, EPA.

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

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EPA-C-0518	Shoreline	SCAT T2 08/30/2010						Remove tar patties; oiled debris in logjam in drainage area	42.35563	-85.28731	(Y) / N
EPA-C-0519	Channel	SCAT T2 08/30/2010	end of segment 22.25 photo # 611 looking upstream from mp 22.25					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35546	-85.28865	(Y) / N
SCD3-9	Shoreline	Shoreline Assessment				X		Oiled vegetation overhang. Cut and remove	42.35428	-85.28658	(Y) / N

Printed Team Members Names: BILL BATES, EPA.
Date: 9/9/10
Comments:

Jack Boss
James Saller
HOWARD PLUM, EPA

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 22.00 to MP 22.25 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Oskey 09-Sept-2010 (date) Enbridge

Signature Gary A. Andrew 9.9.10 (date) EPA

4. **SCAT Reassessment**

Signature Jack W. Boss 9/9/10 (date) Enbridge

Howard Mac. 9/10/10

Signature William Bates 9/10/10 (date) EPA Howard Pham

Signature James Saller 9/10/10 (date) MDNRE

5. **EPA**

Signature Gary Lipson 9/16/10 (date) EPA Division Supervisor

Appendix E
Photos



Photo 0311 – Looking.



Photo 0313 – Looking southeast at right descending bank (overbank). Near EPA-C-0515.



Photo 0314 – Looking northwest at right descending bank (overbank). Near EPA-C-0517.



Photo 0315 – Looking north at right descending bank (overbank). Near EPA-C-0518.



Photo 0316 – Looking south at left descending bank. Near SCD 3-27.



Photo 0317 – Looking north at right descending bank. Near SCD 3-9.



Photo 0318 – Looking.



Photo 0319 – Looking south at left descending bank. Near SCD 3-28.

Field Photo Log – Segment MP 22.25



Photo 0320 – Looking northeast at right descending bank (overbank). Near EPA-C-0518.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 22.50 – MP 22.25 to 22.50

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 22.50 had very light levels of oiling on the right descending bank and minor oil covered debris present on the left descending bank. The overbank areas contained no areas of oil requiring clean-up. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 22.50 consisted of the following:

- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of overhanging limbs
- Woody vegetation less than 2" in diameter removed
- Removal of oiled vegetation leaving roots intact up to 10' from waterline
- Removal of oiled debris

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 22.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
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      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

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  - Segment Inspection Report (SIR)

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  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

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  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

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ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
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TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

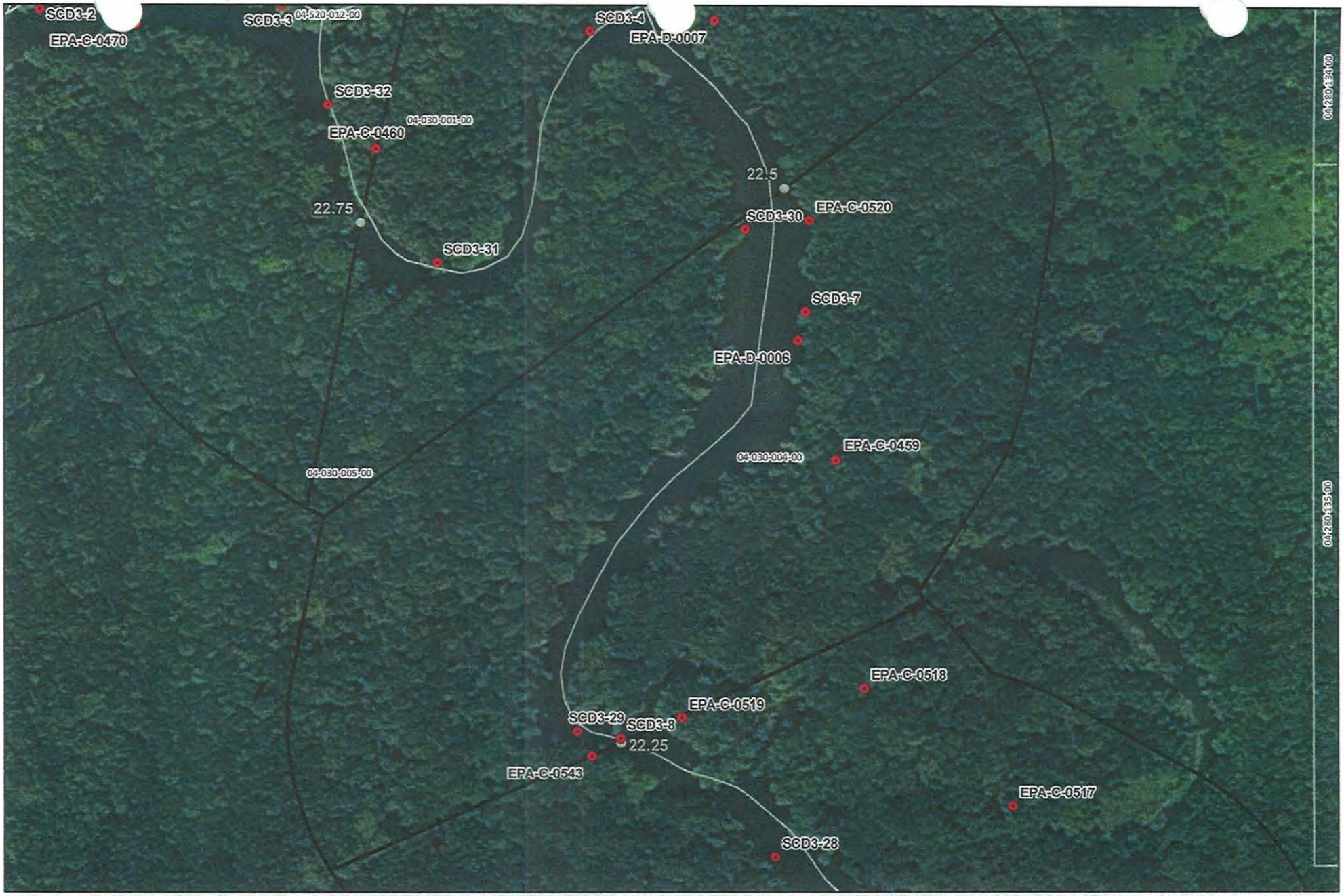
Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

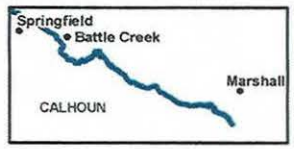
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill										
OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 22.25-22.5 Left Bank While Looking Downstream										
EPA-C-0459	Shoreline	SCAT T3 08/31/2010	GPS is in degrees min and sec (actually Degress decimal Min) and will need to be converted 85.17.252 Lat 42.21.4122; We took a GPS point at the end of the segment in min degrees (42.21.4984 and 85.12.2596). We saw some oiled debris (6' - 12' diameter) sporadically throughout the segment.					No recommendations.	42.35687	-85.28753
SCD3-29	Shoreline	Shoreline Assessment						Shoreline blackened several inches into sand. Further investigation only.	42.35538	-85.28942
SCD3-30	Shoreline	Shoreline Assessment				X		Oiled log in water. Cut and/or remove debris.	42.35812	-85.28822





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division 2: Mile Marker 22.25-22.5
Left Bank While Looking Downstream

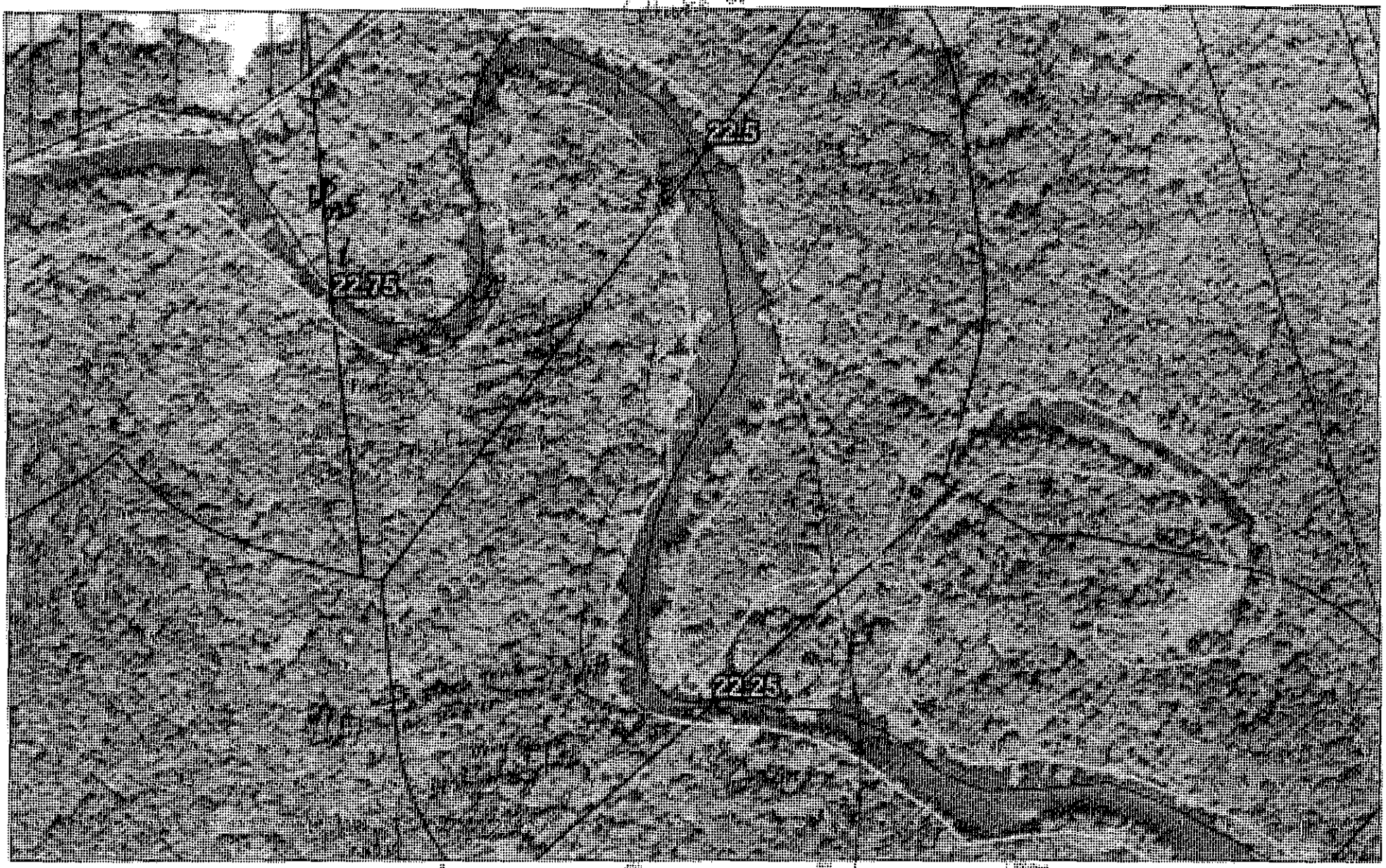
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Team 4
8-31-10

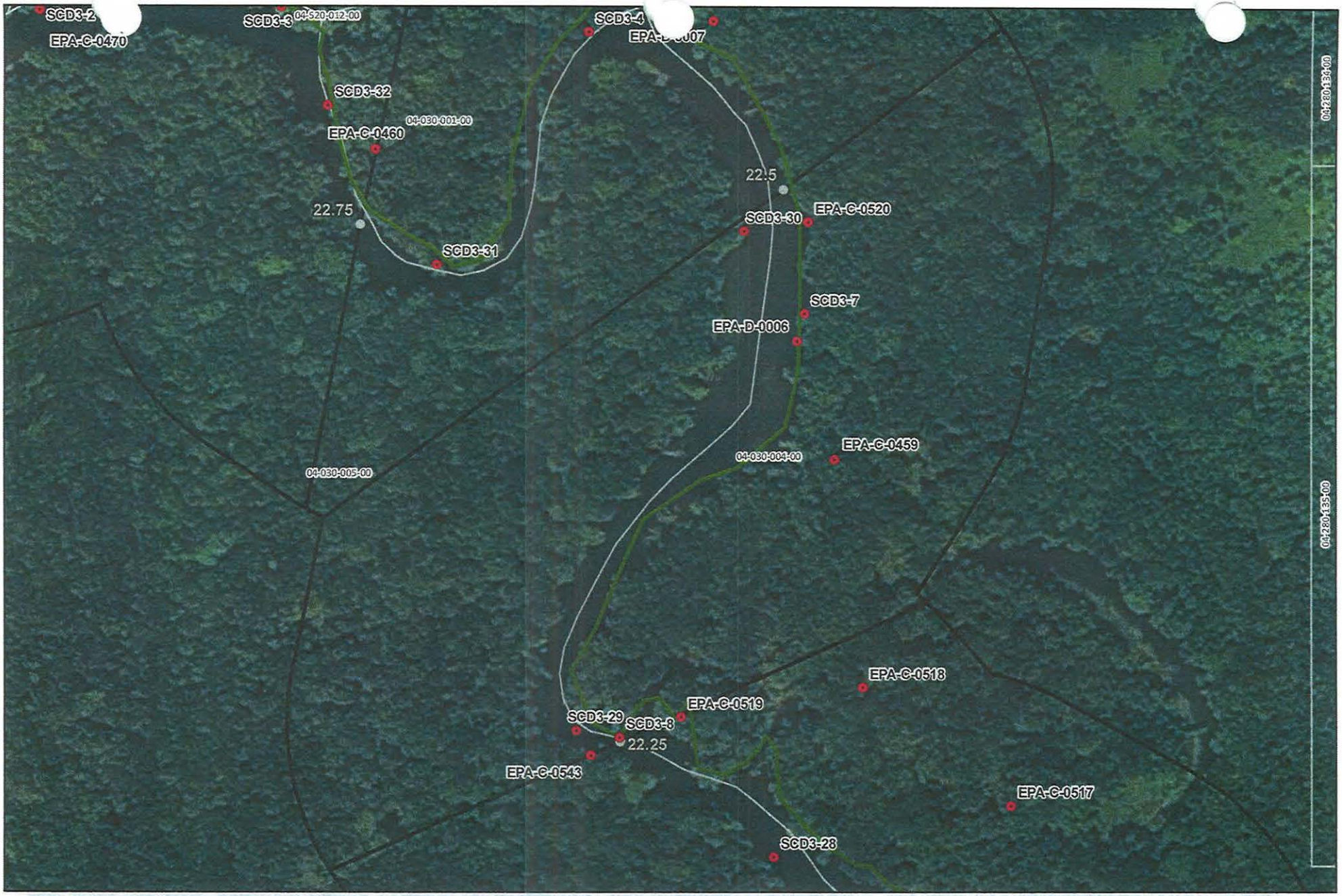
Trim over hanging veg recommended

22.25 to 22.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill										
OPERATIONS CLEANUP RECOMMENDATIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 22.25-22.5 Right Bank While Looking Downstream										
EPA-C-0520	Channel	SCAT T2 08/30/2010	GPS @ end of MP 22. 5 photo #609 looking upstream from MP 22.5 photo # 610 looking downstream from MP 22.25; trace amounts of oiled ebris in drainage area					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35817	-85.28775
SCD3-7	Shoreline	Shoreline Assessment	X			X		Oil log and oiled debris field. Snare and remove oil.	42.35767	-85.28777
SCD3-8	Shoreline	Shoreline Assessment			X			Oiled vegetation overhang. Cut and remove brush.	42.35535	-85.28910





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 22.25-22.5 Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

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Coordinate System: NAD 1983 State Plane Michigan South Feet



QuarterMileMarkers
Parcels_1020OftBuffer
Shoreline
River_C... Miles

Team 4
6-31-10

Trim overhanging veg recommended

22.25 to 22.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business -
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGA... ...H FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 7-Sept 10 Time: AM / PM

Operations Division: 1D Segment ID: From 22.25 Start MP to End MP 22.5 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 78° F

Field Inspection Team

Enbridge Inspector: Doug Deren

Division Supervisor(Contractor): Sto 2 Steve Turner

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 22.25 **Start MP to End MP** 22.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

Reviewed 6 areas of concerns from the SCAT report.
Clean up required is flushing, veg + debris removal and overhanging limbs

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 6 areas of concern from the SCAT report
Clean up is complete according to the SCAT recommendations.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 22.25-22.5 Left Bank While Looking Downstream											
EPA-C-0459	Shoreline	SCAT T3 08/31/2010	GPS is in degrees min and sec (actually Degress decimal Min) and will need to be converted 85.17.252 Lat 42.21.4122; We took a GPS point at the end of the segment in min degrees (42.21.4984 and 85.12.2596). We saw some oiled debris (6' - 12' diameter) sporadically throughout the segment.					No recommendations.	42.35687	-85.28753	(Y) / N
SCD3-29	Shoreline	Shoreline Assessment						Shoreline blackened several inches into sand. Further investigation only.	42.35538	-85.28942	(Y) / N
SCD3-30	Shoreline	Shoreline Assessment				X		Oiled log in water. Cut and/or remove debris.	42.35812	-85.28822	(Y) / N

Printed Team Members Names: BILL BATES
Date: 9/10/10
Comments:
JACK
HOWARD
JAMES

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 22.25-22.5 Right Bank While Looking Downstream											
EPA-C-0520	Channel	SCAT T2 08/30/2010	GPS @ end of MP 22. 5 photo #609 looking upstream from MP 22.5 photo # 610 looking downstream from MP 22.25; trace amounts of oiled ebris in drainage area					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35817	-85.28775	Y / N
SCD3-7	Shoreline	Shoreline Assessment	X			X		Oil log and oiled debris field. Snare and remove oil.	42.35767	-85.28777	Y / N
SCD3-8	Shoreline	Shoreline Assessment			X			Oiled vegetation overhang. Cut and remove brush.	42.35535	-85.28910	Y / N

Printed Team Members Names:
Date: 9/10/10
Comments:

BILL BATES
JACK
HOWARD
JAMES

matted deposits of tar encompassing twigs & litter at several locations near red flag approx 30' from 22.5 mile marker. This continues downstream into next section

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 22.25 to MP 22.50 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley (date) 08-Sept-2010 Enbridge

Signature Gary A. Andrew (date) 9.8.10 EPA

4. **SCAT Reassessment**

Signature Jack W. Boss (date) 9/9/10 Enbridge

Signature WILLIAM J BATES (date) 9/9/10 EPA

Signature James Sallee (date) 9/9/10 MDNRE

5. **EPA**

Signature GARY LIPSON (date) 9/16/10 EPA Division Supervisor

Appendix E
Photos



Photo 0157 – Looking north at right descending bank (overbank). Near EPA-C-0518.



Photo 0158 – Looking north at right descending bank. Near SCD3-8.



Photo 0159 – Looking southwest at left descending bank. Near EPA-C-0459.



Photo 0160 – Looking north at left descending bank.



Photo 0161 – Looking northeast at right descending bank.



Photo 0162 – Looking north at left descending bank.



Photo 0163 – Looking east at right descending bank. Near SCD3-7.



Photo 0164 – Looking south at left descending bank. Near SCD3-30.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 22.75 – MP 22.50 to 22.75

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 22.75 had no oiling on the left descending bank except sporadic oiled debris and vegetation. Light oiling was observed on the right descending bank and island shorelines. Pooled oil in a small alcove on the right descending bank. Island shorelines also had sporadic oiled debris. The overbank areas contained no oiling requiring clean-up. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 22.75 consisted of the following:

- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris
- Removal of overhanging limbs
- Removal of oiled vegetation leaving roots intact.

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Film of mousse remaining on right descending bank near EPA-D-0007

Segment 22.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
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Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

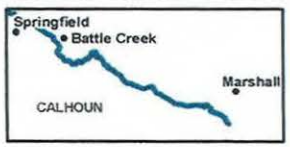
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 22.5-22.75 Left Bank While Looking Downstream										
EPA-C-0460	Shoreline	SCAT T3 08/31/2010	GPS is in degrees min sec. Long 85.17.4568, Lat 42.21.5128; Zone A includes entire RDB and Island. Very sporadic oiled debris appears to have been deposited on the shore during flood stage.					Remove sporadic oiled debris on island and within 10ft of RDB	42.35855	-85.29095
SCD3-31	Shoreline	Shoreline Assessment			X			Oiled vegetation overhanging. Cut and remove branches.	42.35792	-85.29048





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 22.5-22.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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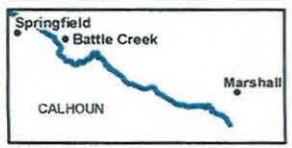
Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 22.5-22.75 Right Bank While Looking Downstream										
SCD3-4	Shoreline	Shoreline Assessment	X	X	X	X		Pooled oil area in small alcove. Oil debris field - snare and remove oil. Stained vegetation overhanging - cut and remove.	42.35920	-85.28938
SCD3-5	Shoreline	Shoreline Assessment	X			X		Oiled debris field - snare and remove.	42.35948	-85.28918
SCD3-6	Shoreline	Shoreline Assessment						Peninsula with patches of oil. Leave for natural attenuation or dig up (not ideal).	42.35940	-85.28892





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 22.5-22.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

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Coordinate System: NAD 1983 State Plane Michigan South Feet



Quarterm&Markers
Parcels_10200ftBuffer
Shoreline
River_Quarterm&Ifes

22.5 to 22.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

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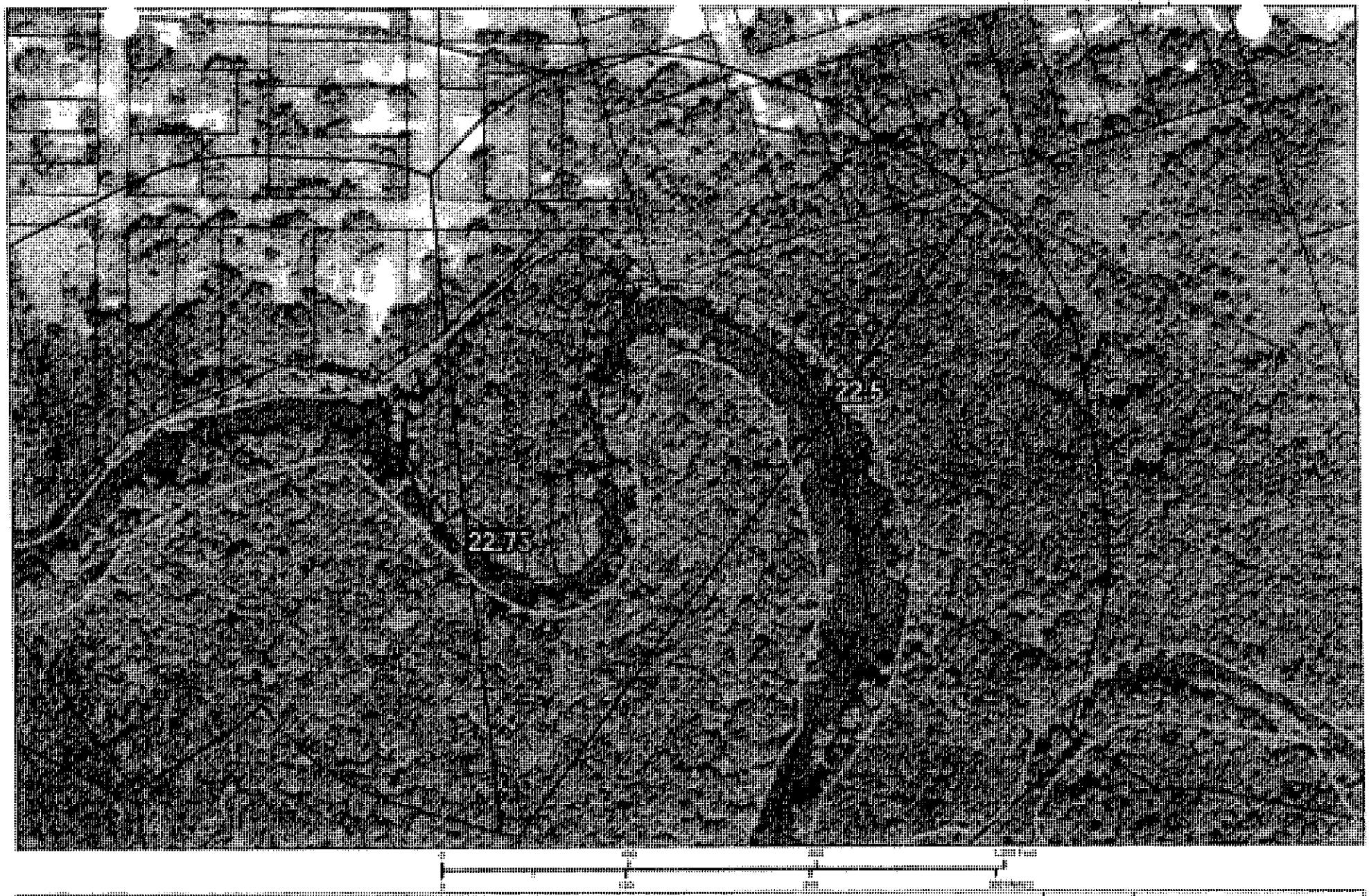
Coordinate System: NAD 1983 STATE PLANE MICHIGAN OUTFEET



22.5 to 22.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

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Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 7-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 22.5 Start MP to End MP 22.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature] STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT points marked green.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Revised9/01/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-18 **Time: AM / PM**

Operations Division: D **Segment ID: From** 22.5 **Start MP to End MP** 22.3 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 5 areas of Concern from the SCAT report
Clean up required is flushing, Pooling, Veg. + debris removal and overhanging limbs.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 5 areas of Concern from the SCAT report
Clean up is complete according to the SCAT recommendations

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 22.5-22.75 Left Bank While Looking Downstream											
EPA-C-0460	Shoreline	SCAT T3 08/31/2010	GPS is in degrees min sec. Long 85.17.4568, Lat 42.21.5128; Zone A includes entire RDB and Island. Very sporadic oiled debris appears to have been deposited on the shore during flood stage.					Remove sporadic oiled debris on island and within 10ft of RDB	42.35855	-85.29095	Y / N
SCD3-31	Shoreline	Shoreline Assessment			X			Oiled vegetation overhanging. Cut and remove branches.	42.35792	-85.29048	Y / N

Printed Team Members Names: Bill Bates, EPA.
Date: 9/1/10
Comments:

Jack Boss
James Saller
Howard Pham, EPA

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 22.5-22.75 Right Bank While Looking Downstream											
SCD3-4	Shoreline	Shoreline Assessment	X	X	X	X		Pooled oil area in small alcove. Oil debris field - snare and remove oil. Stained vegetation overhanging - cut and remove.	42.35920	-85.28938	(Y) / N
SCD3-5	Shoreline	Shoreline Assessment	X			X		Oiled debris field - snare and remove.	42.35948	-85.28918	(Y) / N
SCD3-6	Shoreline	Shoreline Assessment						Peninsula with patches of oil. Leave for natural attenuation or dig up (not ideal).	42.35940	-85.28892	(Y) / N

Printed Team Members Names: Bill Dates, EPA
Date: 9/9/10
Comments:
Jack Boss
James Sellee
Howard Pham, EPA

EPA-D-0007 Shoreline NA Film of Mousse No Further Action Required 42.359267 -85.288467 (Y) / N

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 22.50 to MP 22.75 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley	09-Sept-2010 (date)	Enbridge
Signature Gary A. Andrew	9.9.10 (date)	EPA

4. **SCAT Reassessment**

Signature Jack W. Bost	9/9/10 (date)	Enbridge
Signature WILLIAM J BATES	9/10/10 (date)	EPA HOWARD PHAM
Signature James Sollee	9/10/10 (date)	MDNRE

Howard Pham 9/10/10.

5. **EPA**

Signature GARY LIPSON	9/16/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0321 – Looking east at right descending bank. Near SCD3-6.



Photo 0322 – Looking west at island. Near SCD3-5.



Photo 0323 – Looking southwest at island. Near SCD3-4.



Photo 0324 – Looking southeast at left descending bank.



Photo 0325 – Looking southeast at left descending bank.



Photo 0326 – Looking east at island. Near SCD3-31.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 23.00 – MP 22.75 to 23.00

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 23.00 had sporadic tar and oiled debris on the left descending bank with very light oiling and pockets of pooled oil on the right descending bank. The overbank areas contained light staining on trees. Islands were absent. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 23.00 consisted of the following:

- Removal of oiled vegetation leaving roots intact.
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris
- Removal of overhanging limbs
- Removal of woody vegetation less than 2" in diameter

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled stained trees on right descending bank near MP 23.00 and midway through the Segment near SCD3-3.

Segment 23.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

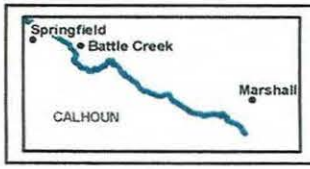
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident, Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 22.75-23.0 Left Bank While Looking Downstream										
EPA-C-0462	Shoreline	SCAT T3 08/31/2010	Original data lost 0.75 mile further down river. 23.0, 23.25, and 23.5 re-entered with patchy data from memory. Sporadic tar and oiled debris observed in this segment throughout the segment.					Refer to the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods	42.35933	-85.29295
EPA-C-0470	Channel	SCAT T4 08/31/2010	Very minor sporadic tar observed throughout segment					No further action required.	42.35921	-85.29272
SCD3-32	Shoreline	Shoreline Assessment			X			Oiled vegetation overhanging. Cut and remove branches.	42.35878	-85.29130
SCD3-33	Shoreline	Shoreline Assessment						Redeploy a submerged boom (sorbent boom).	42.35880	-85.29470





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 22.75-23
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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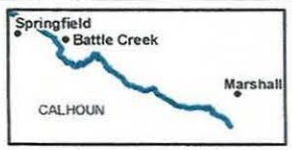
Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 22.75-23.0 Right Bank While Looking Downstream										
SCD3-2	Shoreline	Shoreline Assessment	X	X		X		Pooled oil to left of concrete pipe. Snare and collect oil.	42.35928	-85.29342
SCD3-3	Shoreline	Shoreline Assessment	X	X		X		Pooled oil in sandy area at inlet of private property. Snare and collect oil.	42.35932	-85.29165





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 22.75-23
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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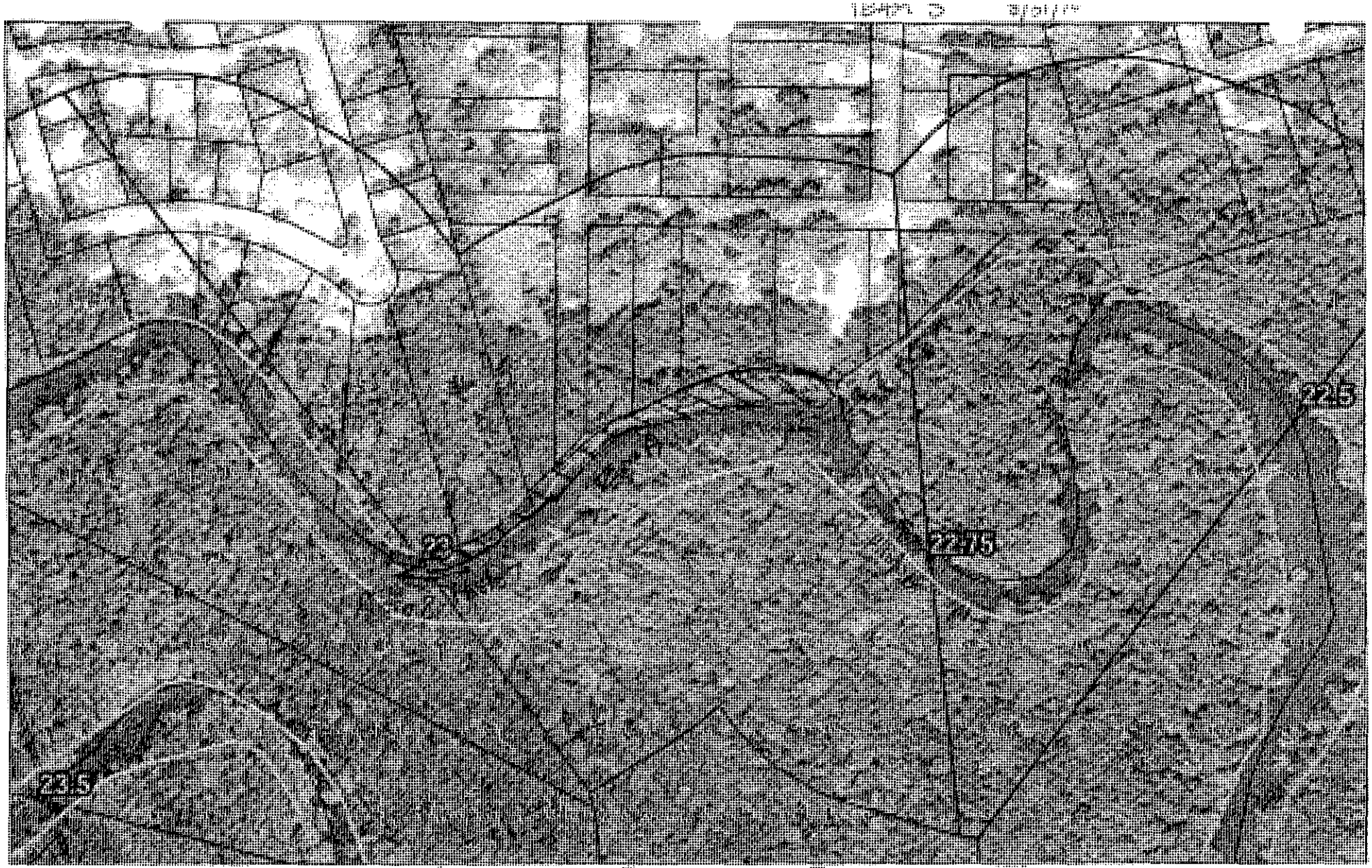
Coordinate System: NAD 1983 State Plane Michigan South Feet



42° 21' 33.60"
85° 17' 34.63"

22.75 to 23

Enbridge Pipeline Failure - Kalamazoo River Oil Spill

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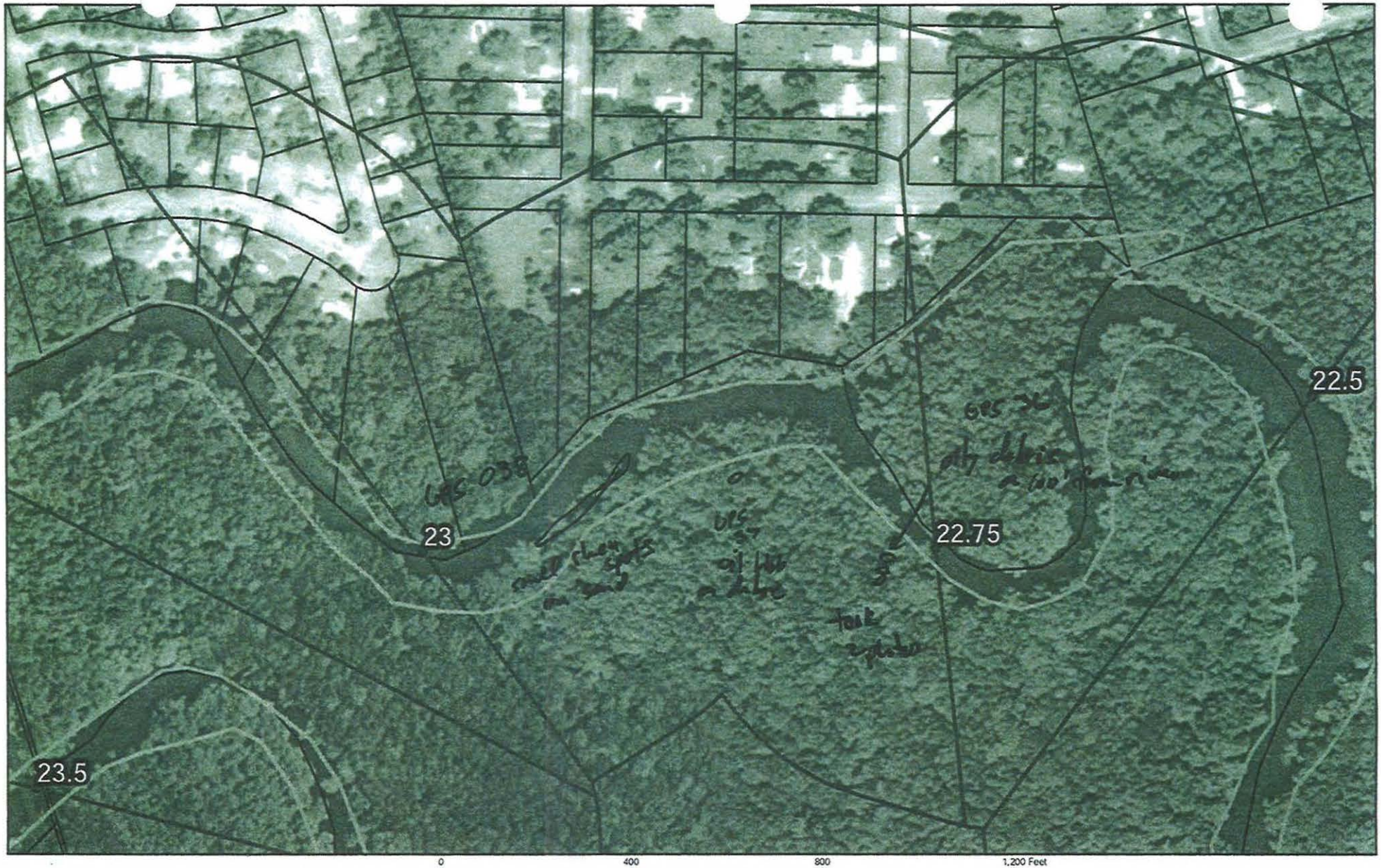

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Parcels_1020ftBuffer
Shoreline
River_Quan...
Divis...

Team 4
6-21-10

22.75 to 23

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

No change recommended

Image: 2009 NAIP

SHEET # 48

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Down to Earth. Down to Business.
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Coordinate System: NAD 1983 STATE PLANE MICHIGAN FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 7 Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 22.75 Start MP to End MP 23.0 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: (Sun)/Cloud/Rain/Snow/ 75°F

Field Inspection Team

Enbridge Inspector: Doug Degen

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

+ Approve all LDB SCAT points
- minor clean up

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

No overbank identified

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

- Approved all RDB SCAT points

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

No overbank identified.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 22.75 **Start MP to End MP** 23.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed 6 areas of concern from the SCAT report
Clean up required is flushing, Pooling, Veg. debris removed and
Overhanging limbs

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 6 areas of concern from the SCAT report
Clean up is complete according to the SCAT recommendations.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 22.75-23.0 Left Bank While Looking Downstream											
EPA-C-0462	Shoreline	SCAT T3 08/31/2010	Original data lost 0.75 mile further down river. 23.0, 23.25, and 23.5 re-entered with patchy data from memory. Sporadic tar and oiled debris observed in this segment throughout the segment.					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35933	-85.29295	(Y) / N
EPA-C-0470	Channel	SCAT T4 08/31/2010	Very minor sporadic tar observed throughout segment					No further action required.	42.35921	-85.29272	(Y) / N
SCD3-32	Shoreline	Shoreline Assessment			X			Oiled vegetation overhanging. Cut and remove branches.	42.35878	-85.29130	(Y) / N
SCD3-33	Shoreline	Shoreline Assessment						Redeploy a submerged boom (sorbent boom).	42.35880	-85.29470	(Y) / N

Printed Team Members Names: BILL BATES, EPA.
Date: 9/9/10
Comments:
Jack Boss
James Salter
HOWARD PIRAM, EPA

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 22.75-23.0 Right Bank While Looking Downstream											
SCD3-2	Shoreline	Shoreline Assessment	X	X		X		Pooled oil to left of concrete pipe. Snare and collect oil.	42.35928	-85.29342	Ø / N
SCD3-3	Shoreline	Shoreline Assessment	X	X		X		Pooled oil in sandy area at inlet of private property. Snare and collect oil.	42.35932	-85.29165	Ø / N

Printed Team Members Names: BILL BATES, EPA,
Jack Boss
James Sallee
HOWARD PHAM, EPA
Date: 9/9/10
Comments:

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 22.75 to MP 23.00 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley (date) 09-Sept-2010 Enbridge

Signature Gary A. Anders (date) 9.9.10 EPA

4. **SCAT Reassessment**

Signature Jack W. Boss (date) 9/9/10 Enbridge

Signature William J Bates (date) 9/10/10 EPA Howard Pham 9/10/1

Signature James Soller (date) 9/10/10 MDNRE

5. **EPA**

Signature Gary Gipson (date) 9/16/10 EPA Division Supervisor

Appendix E
Photos



Photo 0327 – Looking northwest at right descending bank (overbank). Near EPA-C-0460.



Photo 0328 – Looking northeast at right descending bank. Near SCD3-32.



Photo 0329 – Looking east at right descending bank. Near SCD3-32.



Photo 0330 – Looking northeast at right descending bank. Near SCD3-3.



Photo 0331 – Looking south at left descending bank. Near EPA-C-0470.



Photo 0332 – Looking north at right descending bank. Near EPA-C-0462.



Photo 0333 – Looking north at right descending bank. Near SCD3-2.



Photo 0334 – Looking south at left descending bank. Near SCD3-33.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 23.25 – MP 23.00 to 23.25

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 23.25 had no oiling on the left descending bank and very light oiling on the right descending bank. Some areas of pooled oil and oiled debris were present on the right descending bank. The overbank areas contained light staining on trees requiring clean-up. Islands were absent. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 23.25 consisted of the following:

- Removal of oiled vegetation leaving roots intact.
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads.
- Removal of oiled debris
- Removal of overhanging vegetation
- Removal of woody vegetation less than 2" in diameter

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Light oil stained trees on right descending bank near SCD3-1.

Segment 23.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

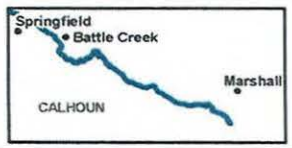
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 23.0-23.25 Left Bank While Looking Downstream										
No Operational Focus Areas Identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 23-23.25
Left Bank While Looking Downstream

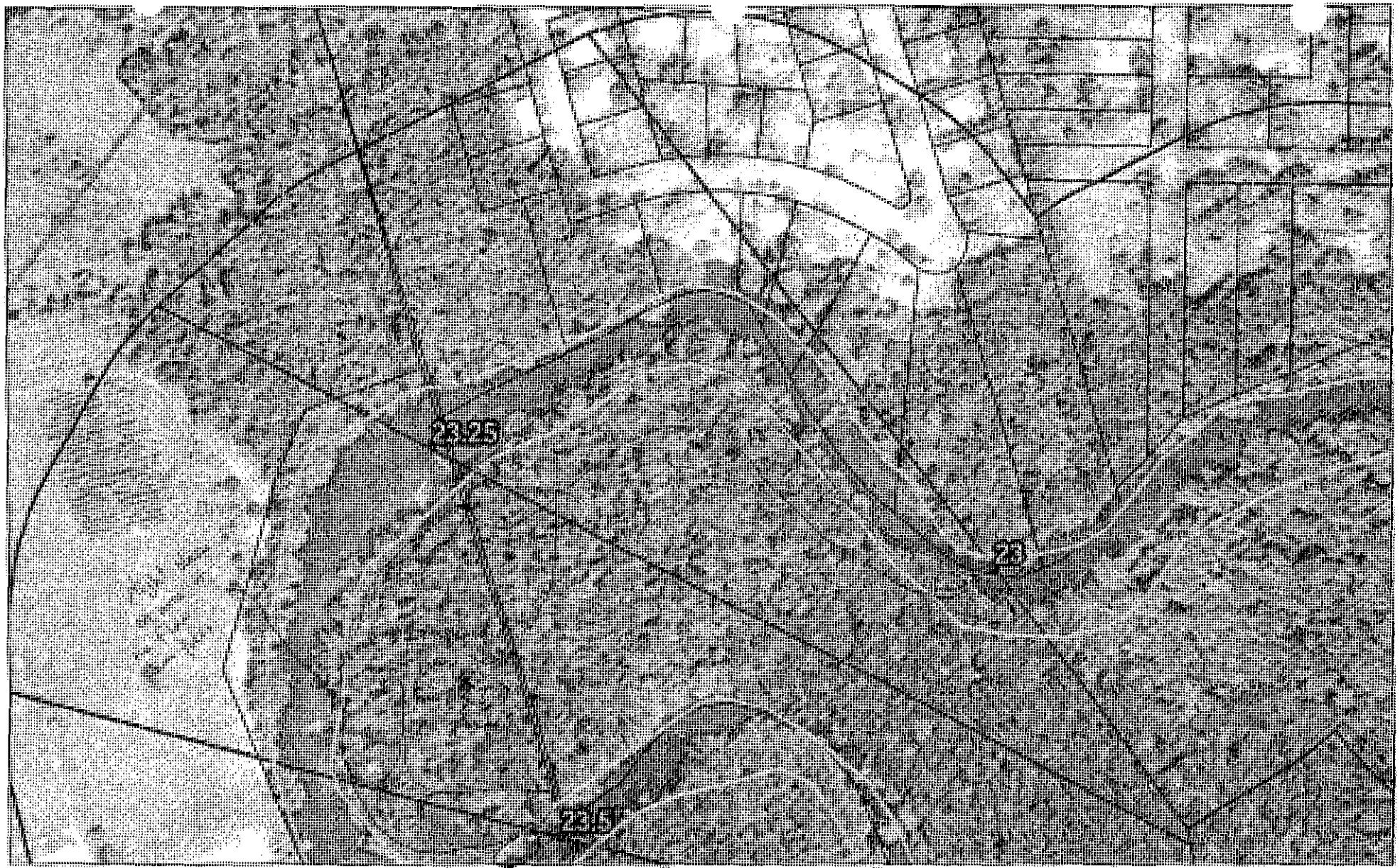
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Team 4
8-31-10

Heavier oil splotted (<5')

23 to 23.25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

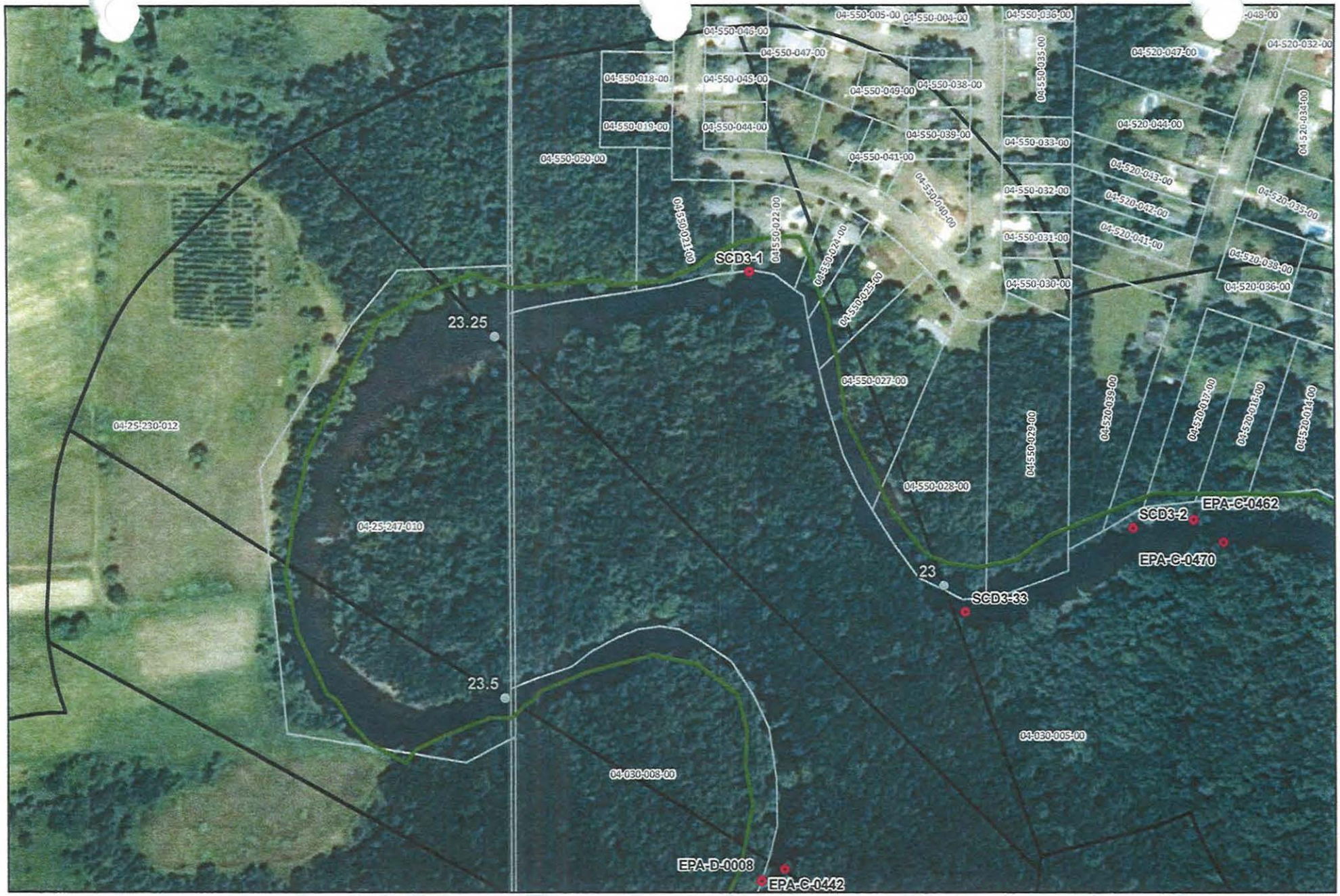
Teamy recommended

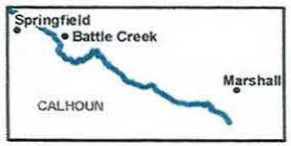
ENTRIX

www.entrix.com

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 23.0-23.25 Right Bank While Looking Downstream										
SCD3-1	Shoreline	Shoreline Assessment	X	X		X		Private property - houses. Pooled oil at oiled debris field. May need to redeploy booms. Remove debris, snare oil & collect.	42.36072	-85.29638





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 23-23.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



23 to 23.25

Enbridge Pipeline Release – Kalamazoo River Oil Spill

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 7 Sept 10 Time: AM / PM

Operations Division: D Segment ID: From 23.0 Start MP to End MP 23.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 75 F

Field Inspection Team

Enbridge Inspector: Dave Devon

Division Supervisor(Contractor): Steve Turner

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

No Recommendations

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

No Rec's

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

No Rec's

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

No Rec's

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 23.0 **Start MP to End MP** 23.25 **Segment Length: 0.25 mile**

Bank: (LDB) / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed one area of concern from the SCAT report.
Clean up required is flushing, Pools, and debris removal.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected one area of concern from SCAT report
Clean up is complete according to the SCAT recommendations

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 23.0-23.25 Left Bank While Looking Downstream											
No Operational Focus Areas Identified.											

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 23.0-23.25 Right Bank While Looking Downstream											
SCD3-1	Shoreline	Shoreline Assessment	X	X		X		Private property - houses. Pooled oil at oiled debris field. May need to redeploy booms. Remove debris, snare oil & collect.	42.36072	-85.29638	(Y) / N

Printed Team Members Names: WILLIAM BATES
Date: 9/9/10
Comments: JACK BOSS (Enbridge)
James Saller (MDNRE)
HOWARD PHAM (EPA).

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 23.00 to MP 23.25 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley	08-Sept-2010 (date)	Enbridge
Signature Gary A. Andrew	9.8.10 (date)	EPA

4. **SCAT Reassessment**

Signature Jack W. Boss	9/9/10 (date)	Enbridge
Signature WILLIAM J BATES	9/9/10 (date)	EPA Howard Phan 9/9/10
Signature James Saller	9-9-10 (date)	MDNRE

5. **EPA**

Signature GARY LIPSON	9/16/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0335 – Looking northwest at left descending bank.

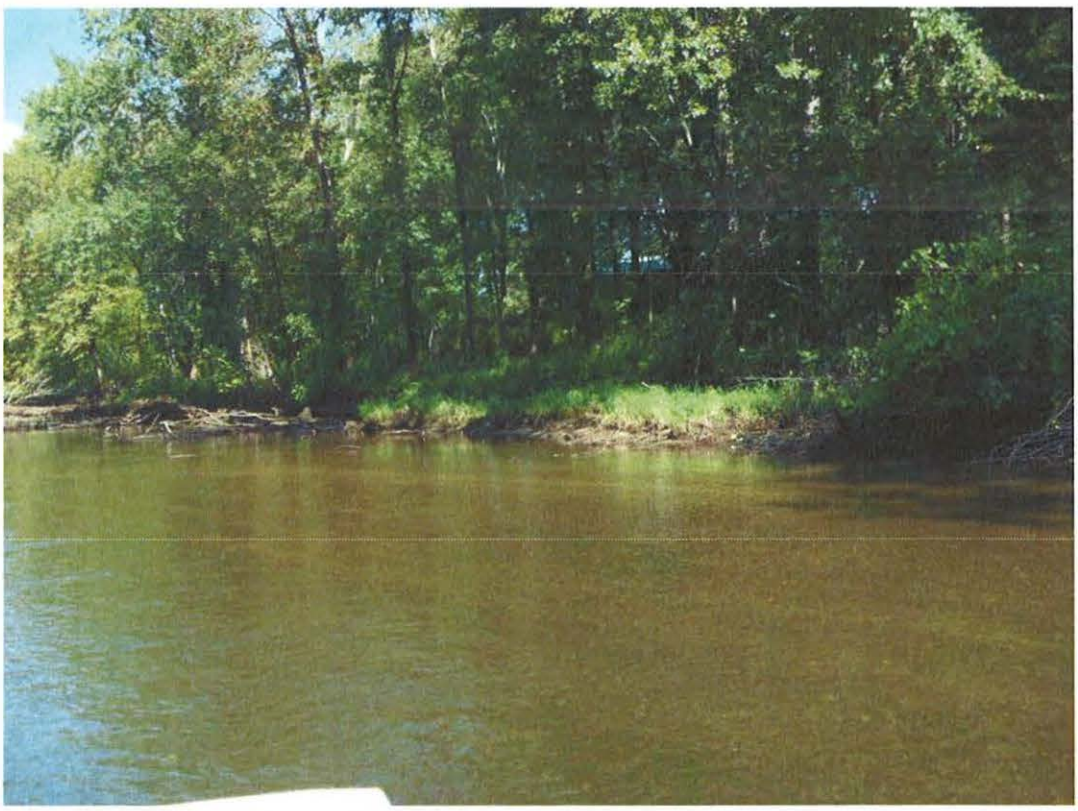


Photo 0336 – Looking northeast at right descending bank.



Photo 0337 – Looking northeast at right descending bank. Near SCD3-1.



Photo 0338 – Looking southwest at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 23.50 – MP 23.25 to 23.50

Enbridge Energy

September 15, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 23.50 had no oiling on the left descending bank and very light oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and no islands were present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 23.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

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  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

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SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

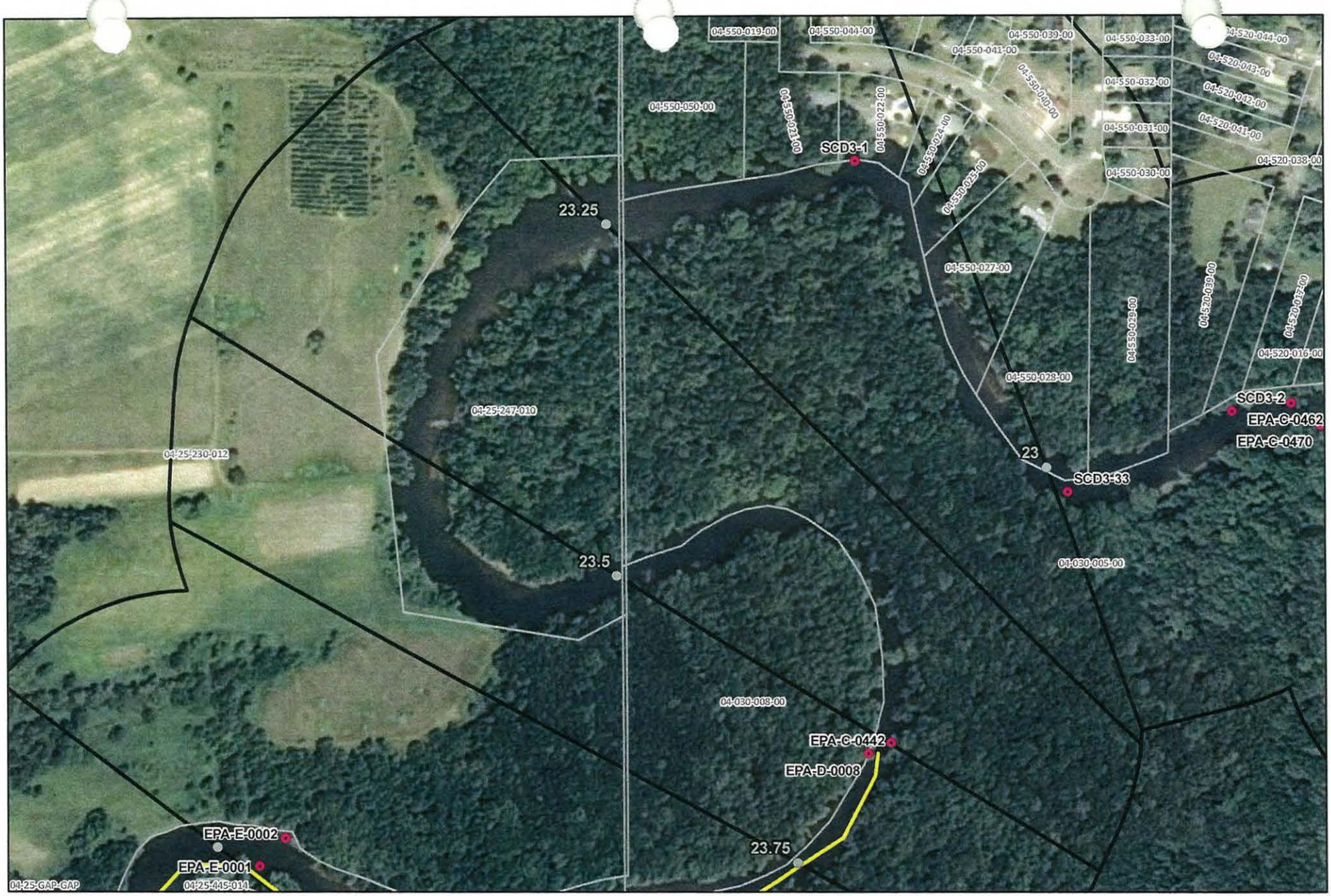
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

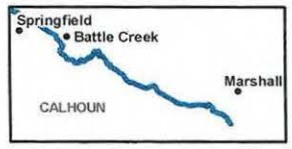
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 23.25-23.50 Left Bank While Looking Downstream										
No Operational Focus Areas Identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 23.25-23.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

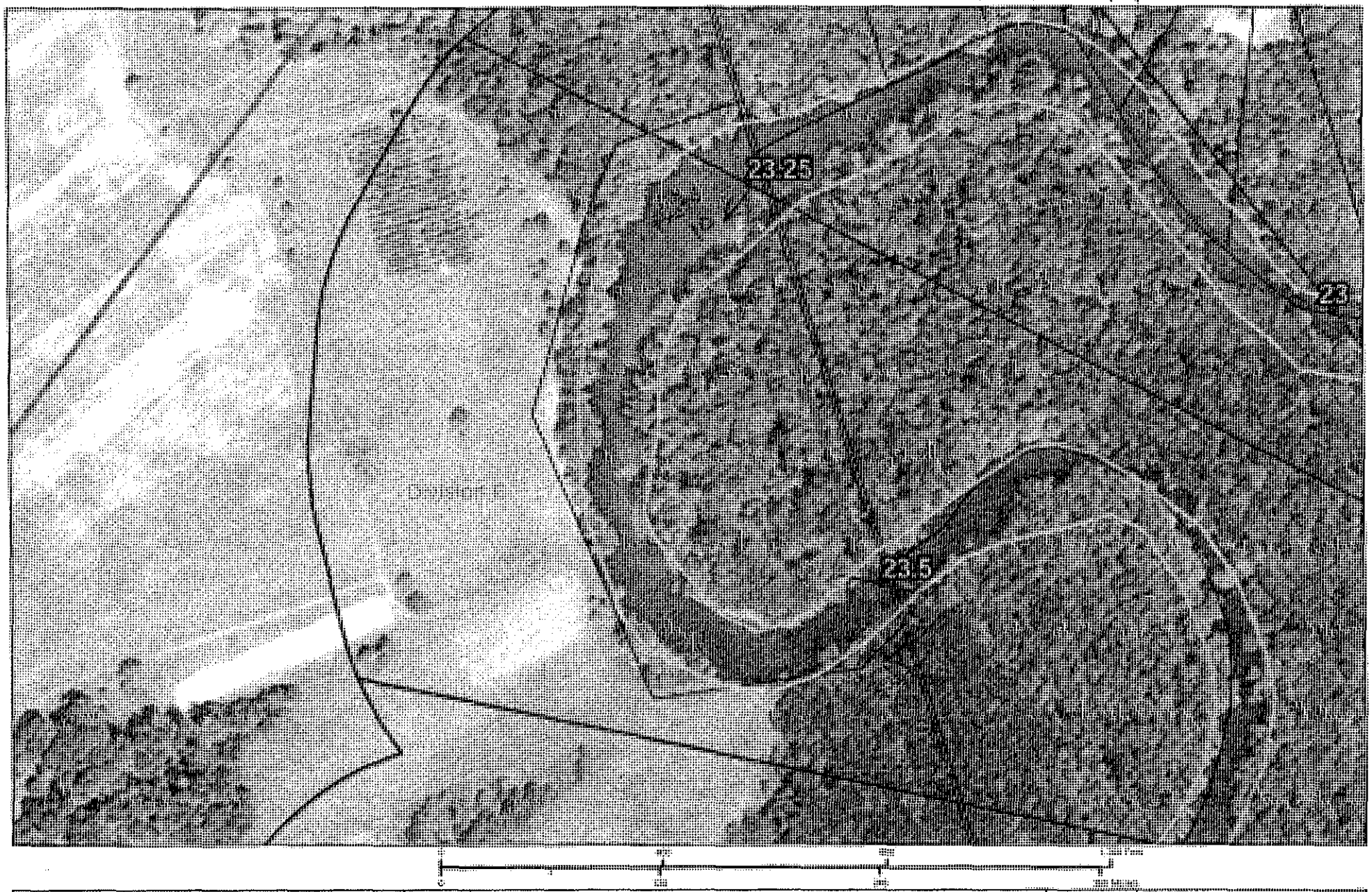
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TEAM 3 9/31/10



Quartermile Markers
Parcels_1020ftBuffer
Shoreline
River-Ft Miles

23.25 to 23.5

Enbridge Pipeline Releas[illegible]cident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business.

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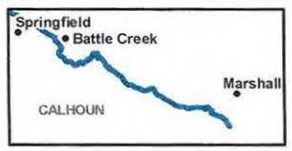
Coordinate System [illegible] 1983 STATE PLANE MICH[illegible]

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 23.25-23.5 Right Bank While Looking Downstream										
No Operational Focus Areas Identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 23.25-23.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: D **Segment ID: From MP** 23.25 **to MP** 23.5 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HALL	8-30-10 (date)	Enbridge
Signature MJ NALEPINSKI	2 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Amanda Bohrendorf	9/7/10 (date)	Enbridge
Signature Stephen Ball	9/5/10 (date)	EPA
Signature Dave Strouse	9/5/10 (date) 9/5/10	MDNRE

5. **EPA**

Signature GARY LIPSON	9/16/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0165 – Looking south at right descending bank.



Photo 0166 – Looking south at left descending bank.



Photo 0167 – Looking south at right descending bank.



Photo 0168 – Looking southeast at left descending bank.



Photo 0169 – Looking east at left descending bank.



Photo 0170 – Looking southeast at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 23.75 – MP 23.50 to 23.75

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 23.75 had light oiling on the left descending bank and very light oiling on the right descending bank. The overbank areas contained no areas requiring clean-up and islands were absent. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 23.75 consisted of the following and were completed prior to initial SCAT:

- Removal of woody vegetation less than 2” in diameter
- Removal of oiled vegetation leaving roots intact
- Removal of overhanging limbs

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 23.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

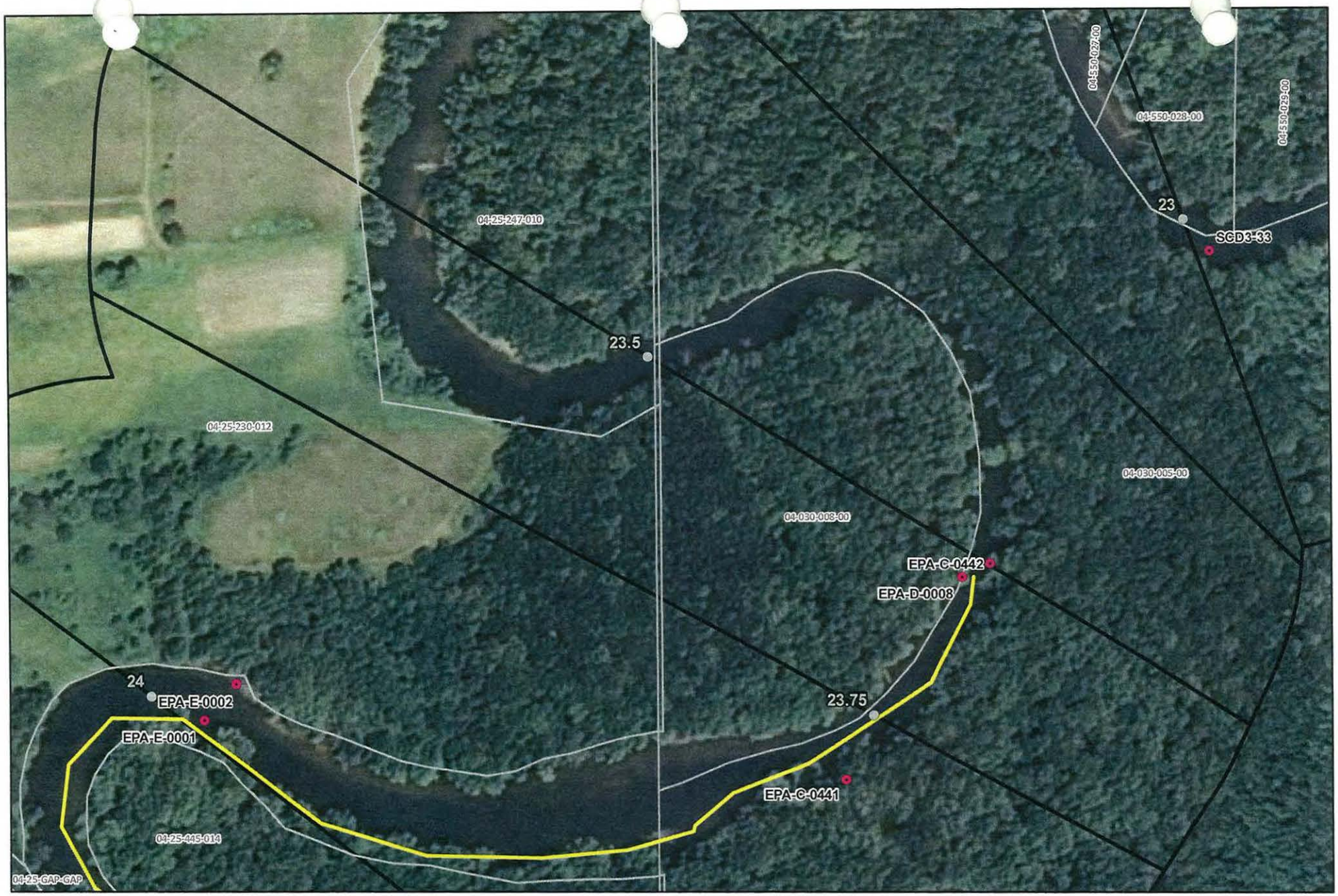
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

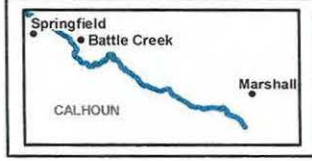
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 23.5-23.75 Left Bank While Looking Downstream										
EPA-C-0441	Shoreline	SCAT T1 08/31/2010	At mile post 23.75; In seg 23.75 thru 24					Refer to the Kalamazoo River/Enbridge Spill: Cleanup Recommendation Methods	42.35632	-85.29697





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 23.5-23.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

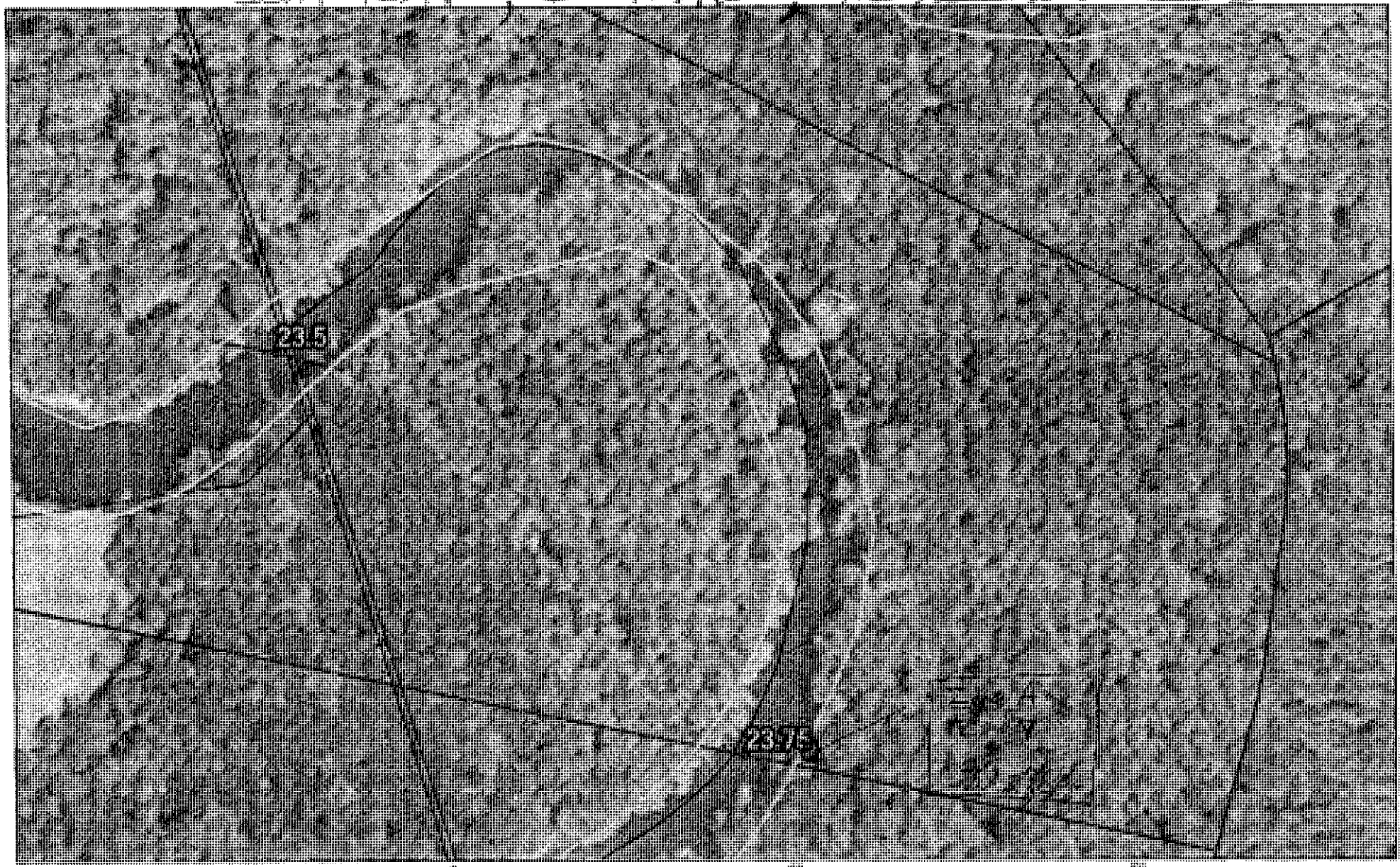
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

SCAT Team 1, B 8/31/10 [redacted]



0 120 240

85°17'45.86"
42°21'26.40

23.5 to 23.75

Quarternmile Markers
Parcels_10200ftBuffer
Shoreline
River_Quarter
Divisi

Enbridge Pipeline Releas[illegible]ent – Kalamazoo River Oil Spill

Image 2009 NAIP

SHEET # 48

ENTRIX
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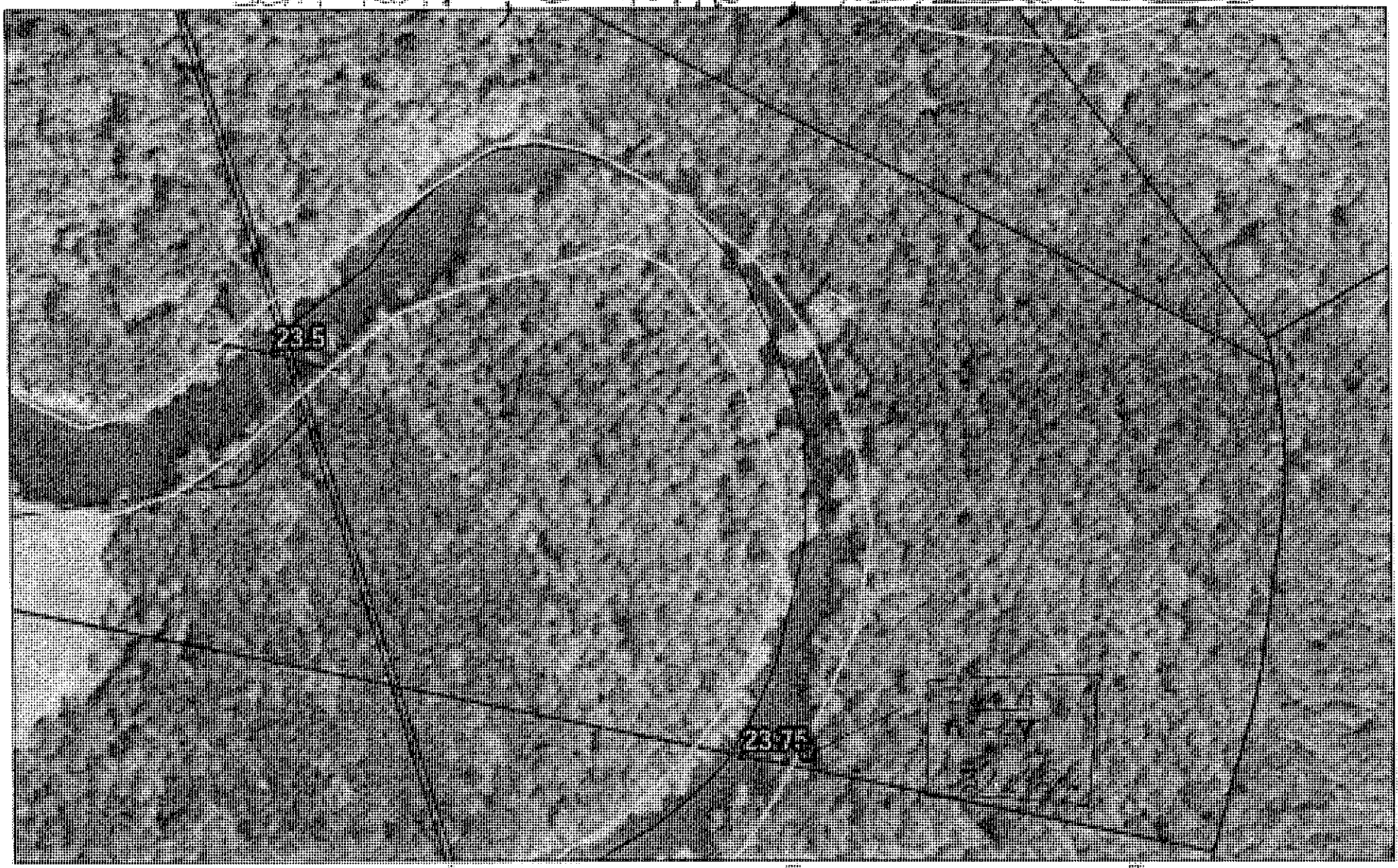
Coordinate System [illegible] 83 STATE PLANE MICHIGA[illegible]

SCAT Team 1, 2 8/31/10



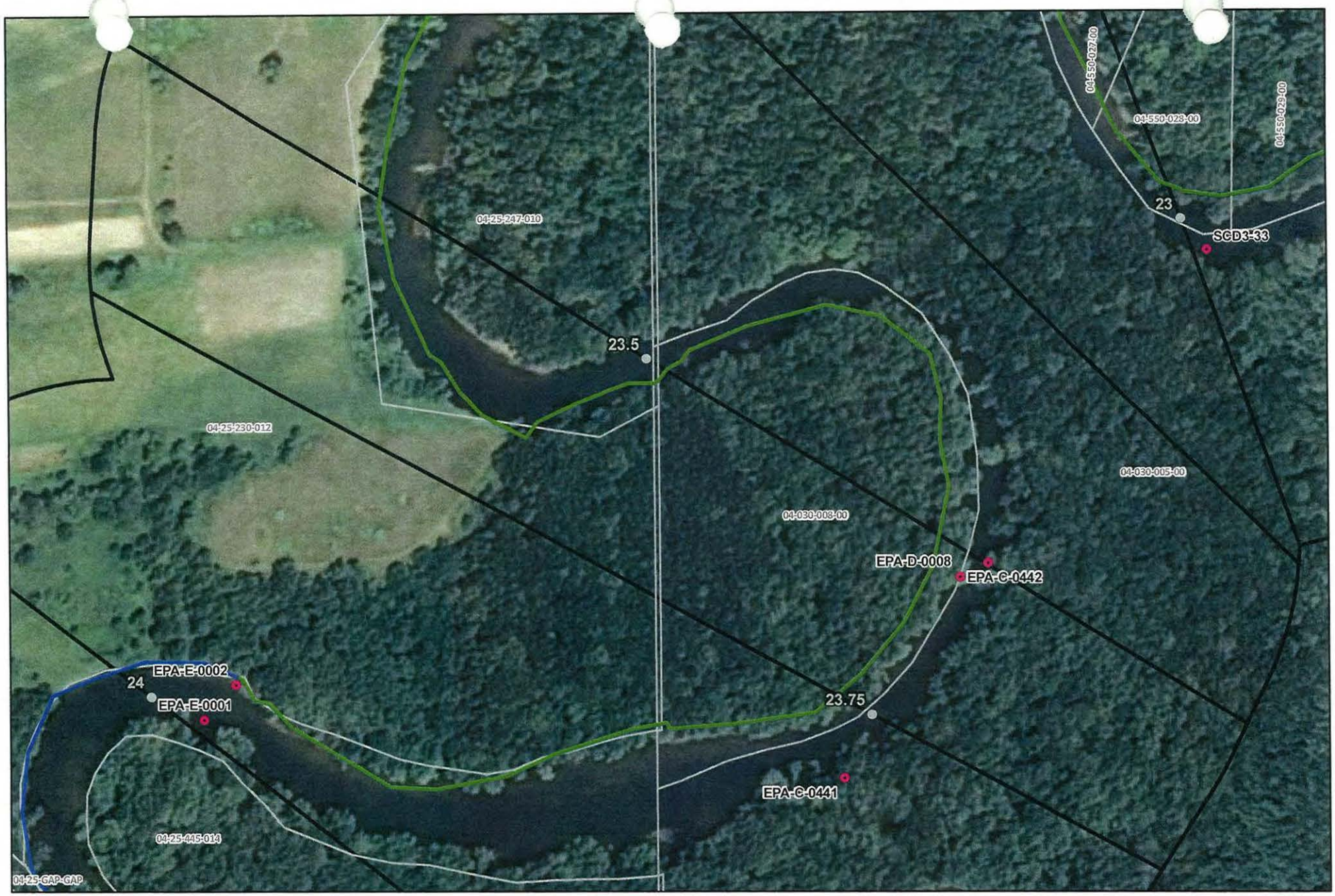
85° 9' 45.8"
45° 21' 26.1"
23.5 to 23.75

Enbridge Pipeline Release — Yazoo – Kalamazoo River Oil Spill

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 23.5-23.75 Right Bank While Looking Downstream										
No Operational Focus Areas Identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 23.5-23.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

TEAM 3 8/31/10



0 1320 2640

QuartermileMarkers
Parcels_10200ftBuffer
Shoreline

Lost ~~2#~~
23-2350

23.5 to 23.75

Enbridge Pipeline Rel[illegible] cident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET 1 of 48

ENTRIX
Down to Earth Down to Business

www.entrix.com

Coordinate System: [illegible] 1983 STATE PLANE Mich[illegible]

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 7-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 23.5 Start MP to End MP 23.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 75°F

Field Inspection Team

Enbridge Inspector: [signature] Doug Deron.

Division Supervisor(Contractor): [signature] STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

N/A

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

N/A

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

N/A

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

N/A

Revised9/01/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 23.5 **Start MP to End MP** 23.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

No recommended actions

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

None

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 23.5-23.75 Left Bank While Looking Downstream											
EPA-C-0441	Shoreline	SCAT T1 08/31/2010	At mile post 23.75; In seg 23.75 thru 24					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.35632	-85.29697	(Y) / N

Printed Team Members Names: WILLIAM BATES
Date:
Comments: 9/9/10

Jack Boss (Enbridge)
James Saller (MDNRE)
Howard Pham (EPA).

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill											
SCAT REASSESSMENT SHEET											
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 23.5-23.75 Right Bank While Looking Downstream											
No Operational Focus Areas Identified.											

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 23.50 to MP 23.75 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley (date) 08-Sept-2010 Enbridge

Signature Gary A. Anlauf (date) 9-8-10 EPA

4. **SCAT Reassessment**

Signature Jack W. Boss (date) 9/9/10 Enbridge

Howard Pham. 9/9/10
Howard Pham

Signature William J Bates (date) 9/9/10 EPA

Signature James Saller (date) 9-9-10 MDNRE

5. **EPA**

Signature GARY LIDSON (date) 9/17/10 EPA Division Supervisor

Appendix E
Photos



Photo 0340 – Looking northeast at left descending bank.



Photo 0341 – Looking southeast at right descending bank.



Photo 0342 – Looking southeast at left descending bank. Near EPA-C-0442.



Photo 0343 – Looking west at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 24.00 – MP 23.75 to 24.00

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 24.00 had light oiling on the left descending bank and very light oiling on the right descending bank. The overbank areas contained no areas requiring clean-up and islands were absent. There were no problematic areas that required special considerations.

Actions

The limbs were cut and vegetation was removed based on the initial Shoreline Assessment and level of staining. As a result of the SCAT overbank assessment, no additional operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled trees (light staining) remain on right descending bank near Segment 23.75
- Some oiled soil remains on left and right descending banks

Segment 24.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

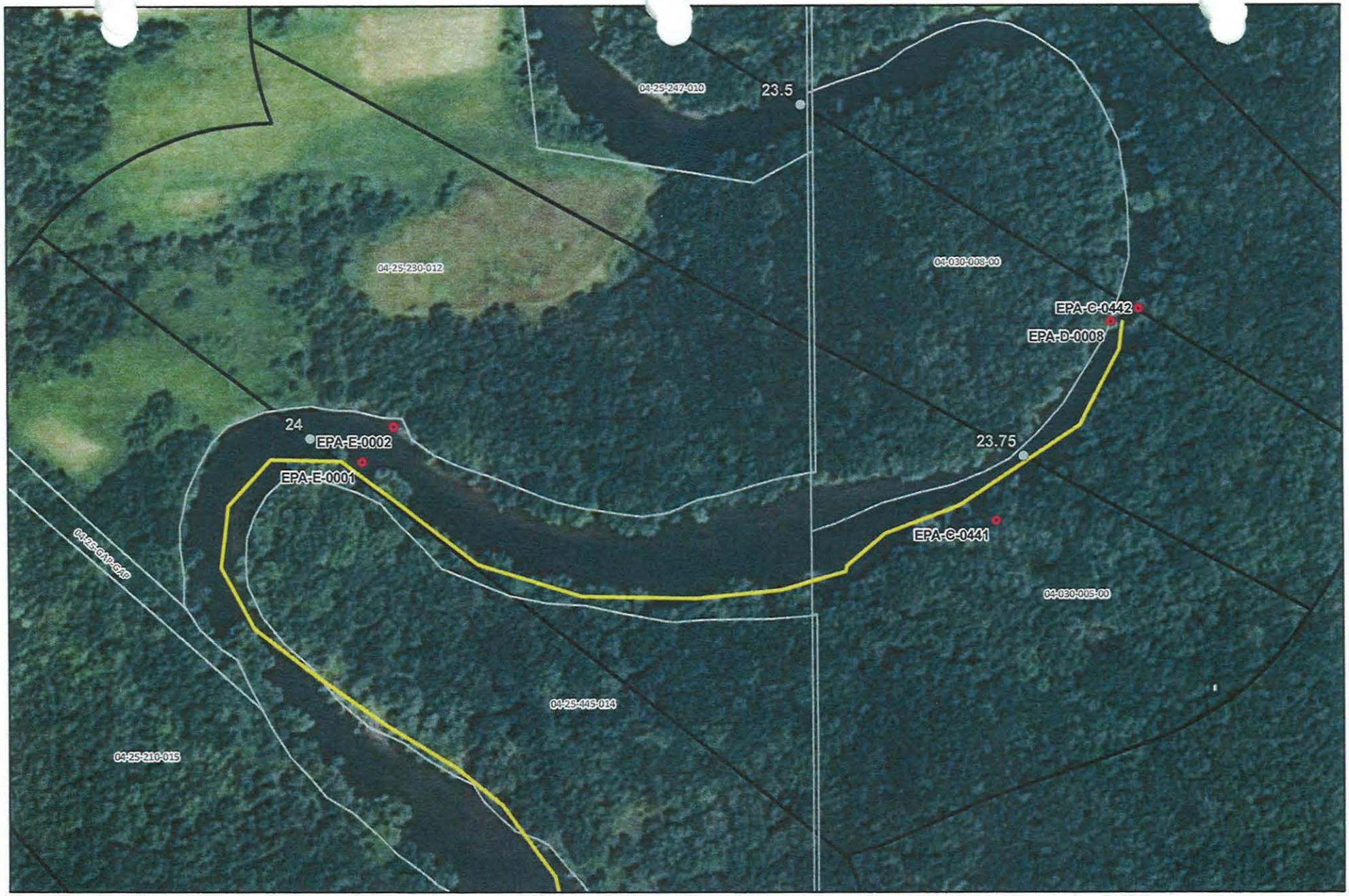
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

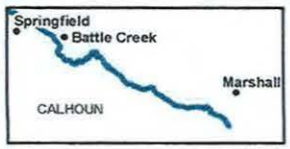
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 23.75-24.0 Left Bank While Looking Downstream										
EPA-C-0442	Shoreline	SCAT T1 08/31/2010	Light oil throughout segment, but no recommendations are requested					No further action required.	42.35733	-85.29607





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Division C: Mile Marker 23.75-24
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

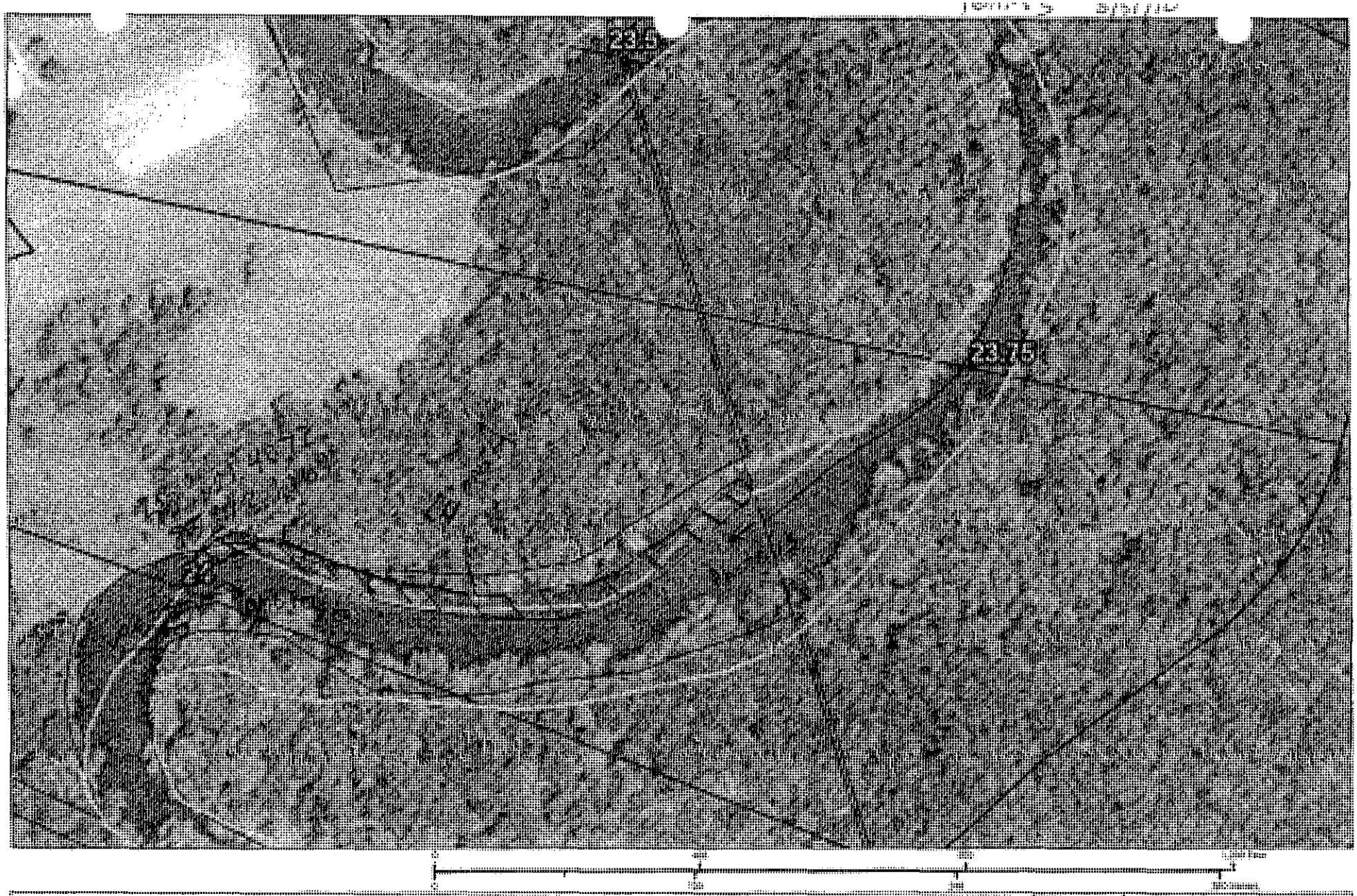
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



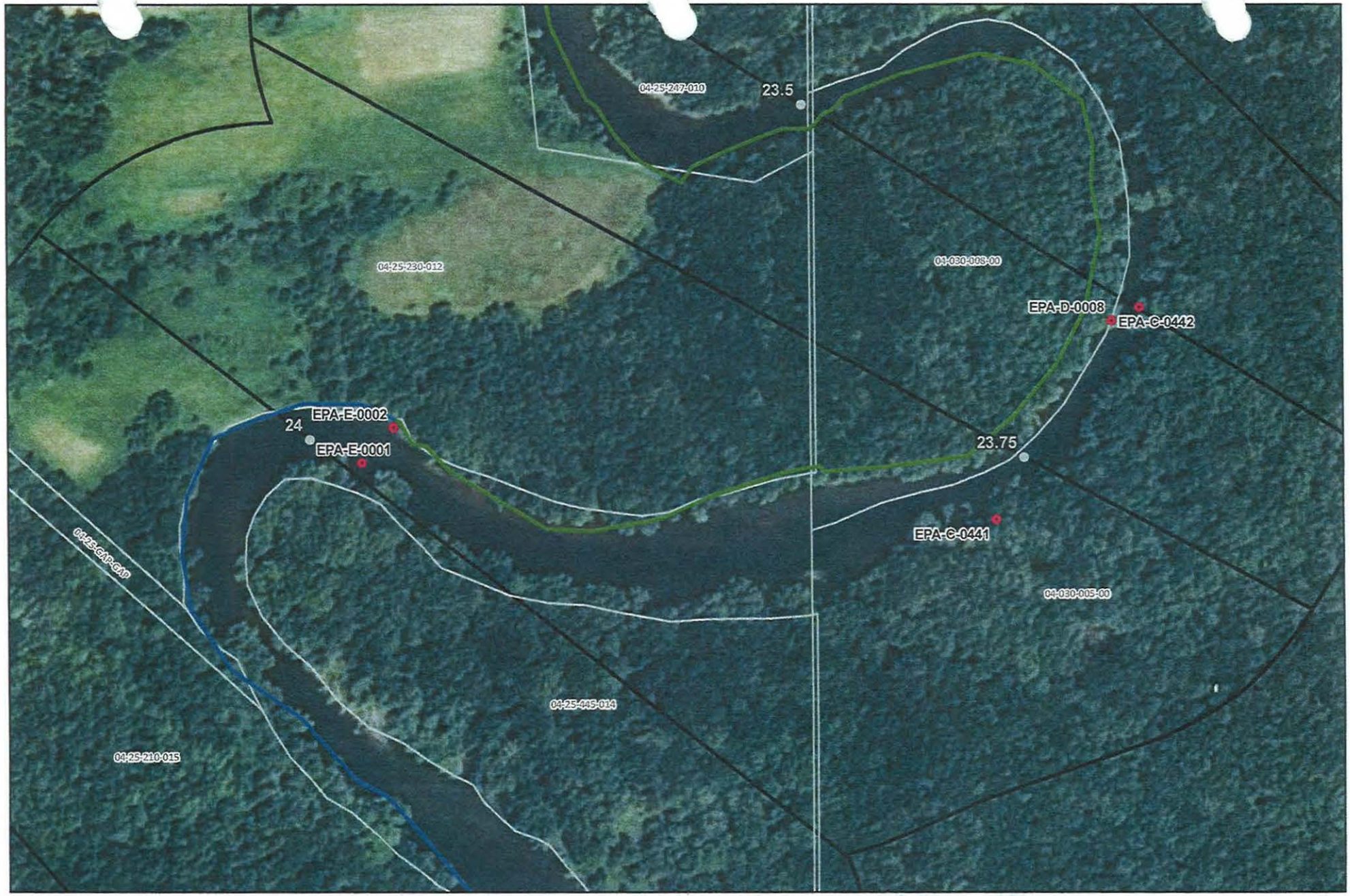
23.15 to 24

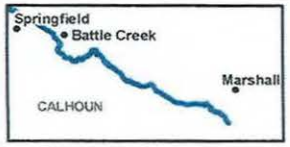
Enbridge Pipeline Rupture Incident – Kalamazoo River Oil Spill

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division D: Mile Marker 23.75-24.0 Right Bank While Looking Downstream										
No Operational Focus Areas Identified.										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division C: Mile Marker 23.75-24
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

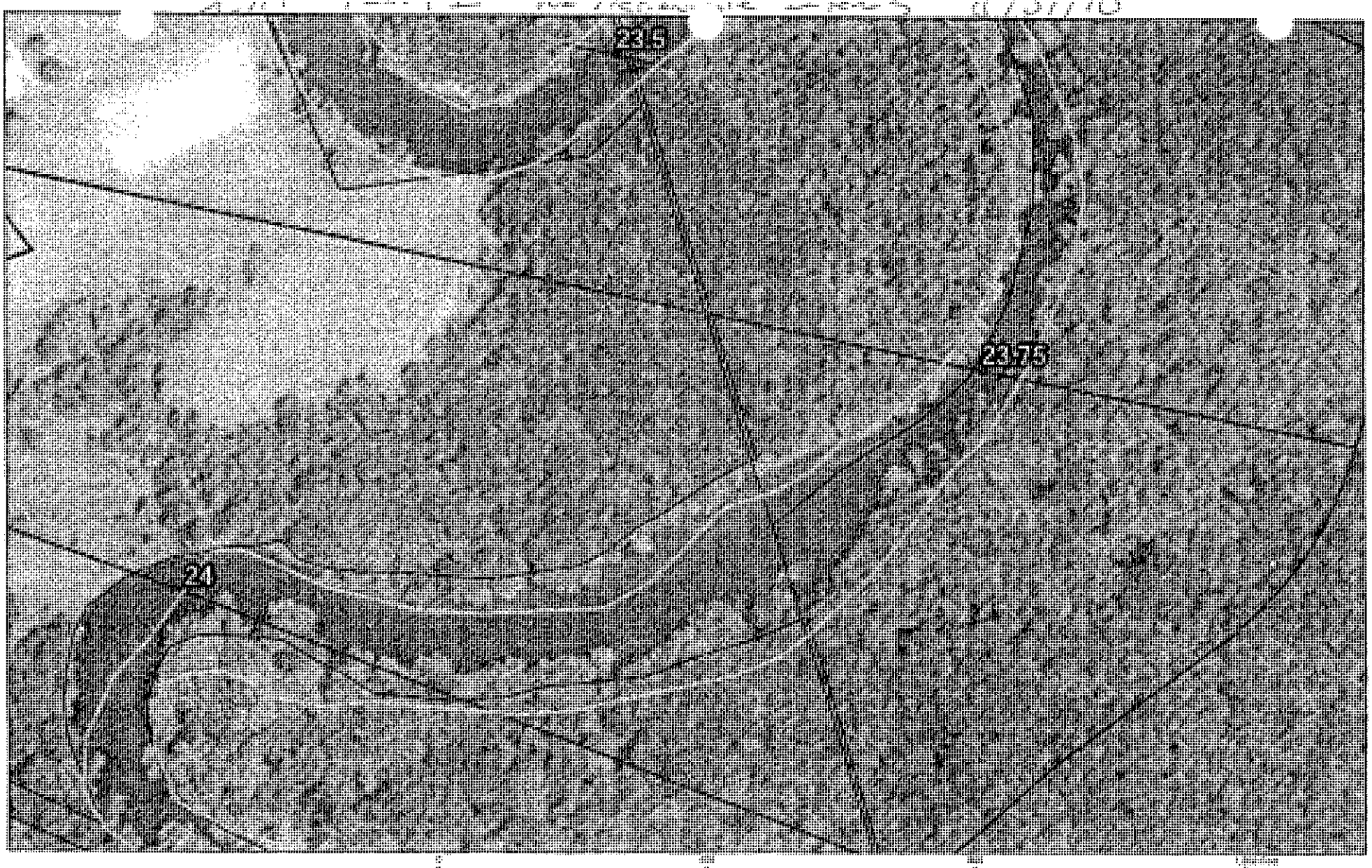
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



23.75 to 24

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 7-Sept-10 Time: AM / PM

Operations Division: D Segment ID: From 23.75 Start MP to End MP 24.0. Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 75°F

Field Inspection Team

Enbridge Inspector: [signature] Doug Dean.

Division Supervisor(Contractor): [signature] STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

No Recommendations.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

No Recs

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

No Rec's

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

No Rec's

Revised9/01/10

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-7-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 23.75 **Start MP to End MP** 24.0 **Segment Length: 0.25 mile**

Bank: ~~LDB / RDB~~ ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

No recommended actions

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

None

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 23.75-24.0 Left Bank While Looking Downstream											
EPA-C-0442	Shoreline	SCAT T1 08/31/2010	Light oil throughout segment, but no recommendations are requested					No further action required.	42.35733	-85.29607	Y / N

Printed Team Members Names: Bill Bates (EPA),
Date: 9/9/10
Comments: Howard Pham (EPA)
James Sallee (MDNRE)
Jack Boss (Enbridge)

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT SHEET

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment Satisfactory?
Division D: Mile Marker 23.75-24.0 Right Bank While Looking Downstream											
No Operational Focus Areas Identified.											

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 23.75 to MP 24.00 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley (date) 08-~~to~~ Sept-2010 Kwe. Enbridge

Signature Gary A. Andrew (date) 9.8.10 EPA

4. **SCAT Reassessment**

Signature Jack W. Boss (date) 9/9/10 Enbridge

Signature WILLIAM J BATES (date) 9/9/10 EPA Howard Pham 9/9/10

Signature James Sellers (date) 9-9-10 MDNRE

5. **EPA**

Signature GARY LIPSON (date) 9/17/10 EPA Division Supervisor

Appendix E
Photos



Photo 0344 – Looking east at left descending bank. Near EPA-C-0041.



Photo 0345 – Looking southwest at left descending bank. .



Photo 0346 – Looking northwest at right descending bank.



Photo 0347 – Looking west at right descending bank.



Photo 0348 – Looking southwest at left descending bank.

Handwritten edits provided by EPA, which were incorporated into the final reports

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the response completion report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 24.00 had light oiling on the left descending bank and very light oiling on the right descending bank. The overbank areas contained no areas requiring clean-up and islands were absent. There were no problematic areas that required special considerations.

Actions

Tree limbs were cut and vegetation was removed based on the initial Shoreline Assessment and level of staining

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

SCAT overbank additional

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled trees (light staining) remain on right descending bank near Segment 23.75
- ~~Some oiled soil remains on left and right descending banks~~

Segment 24.00 has reached the operational endpoints pursuant to EPA's Clean Water Act. The appendices attached provide additional details on this segment

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 24.25 – MP 24.0 to 24.25

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 24.25 had light oiling, pooled oil and oiled vegetation on the left descending bank. No islands were present in this segment. No oil was observed on the right descending bank but pooled oil in a log jam was observed. The overbank contained no areas requiring clean-up. Please note that operations were completed between the USEPA managed SCAT survey and the Enbridge managed SCAT survey. During the Enbridge SCAT survey, no operational focus areas were identified for the entire segment.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendation Methods. At EPA-C-707, tarballs were observed on the sandy shore and manually removed during reassessment.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 24.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

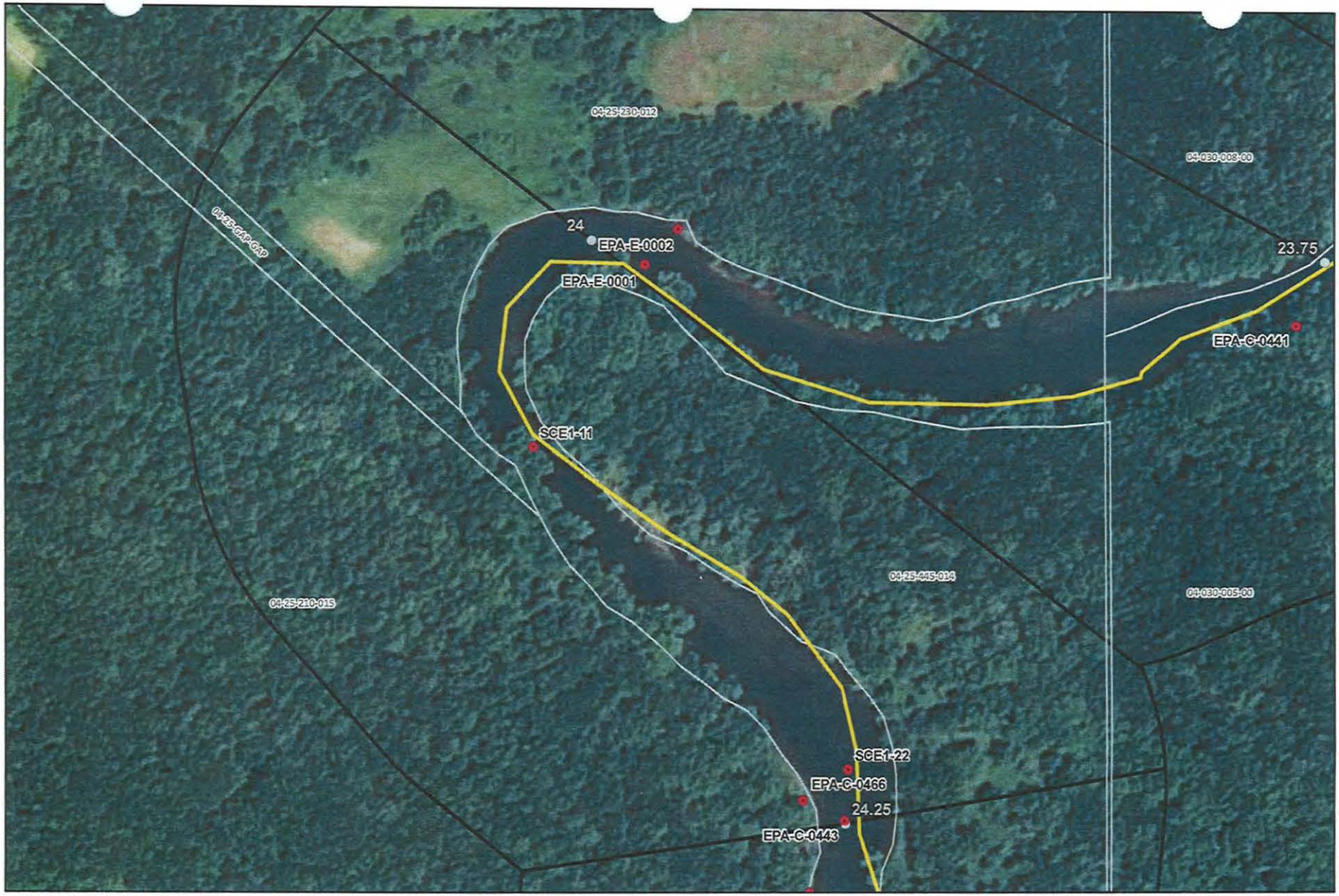
- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addresses

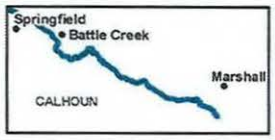
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release li... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 24.0-24.25 Left Bank While Looking Downstream										
SCE1-22	Shoreline	Shoreline Assessment	•	•	•	•	Hit of oil on offshore stump. Overhanging vegetation. Also, pooled oil behind stump. Cut vegetation and remove. High volume flush and collect with snare.	High volume flush and collect with snare.	42.35425	-85.29973
EPA-C-0443	Shoreline	SCAT T1 08/31/2010						No actionable items.	42.35401	-85.29975





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 24-24.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

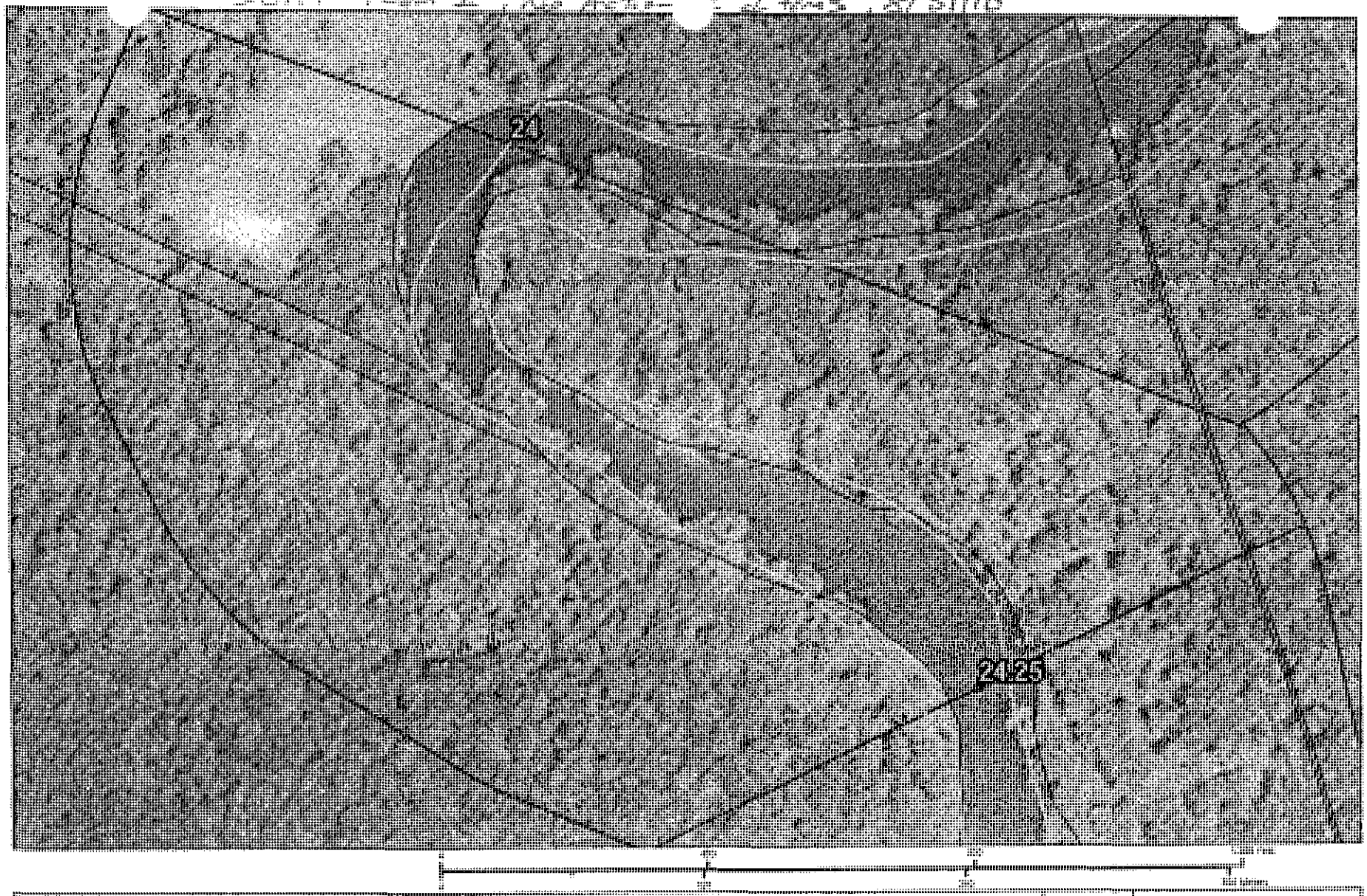
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

SCAT Team 1 ... 8/31/10



24 to 24.25

ENTRIX

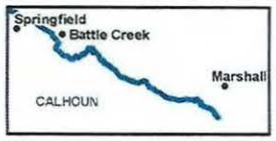
www.entrix.com

Enbridge Pipeline Release Ir... nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 24.0-24.25 Right Bank While Looking Downstream										
SCE1-11	Shoreline	Shoreline Assessment	•	•		•	Pooled oil in log jam. Collect with snare and dispose.	Pooled oil in log jam. Collect with snare and dispose.	42.35572	-85.30172
EPA-C-0466	Channel	SCAT T3 08/31/2010	85.18.001	42.21.2464; GPS coordinates in Degrees Minutes. No oil observed in this segment. Coordinates serve as end of segment.				No actionable item	42.35411	-85.30002





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 24-24.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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Coordinate System: NAD 1983 State Plane Michigan South Feet



24 to 24.25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 10-Sept-10 Time: AM / PM

Operations Division: E Segment ID: From 24.00 Start MP to End MP 24.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 24°C

Field Inspection Team

Enbridge Inspector: Doug DEREN 10-Sept-10.

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

No Recommendations

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-12-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 240 **Start MP to End MP** 24.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

After reviewing the SCAT report this Section had no actionable Items

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

No Recommended actions + No Oil observed

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 24.0-24.25 Left Bank While Looking Downstream										
SCE1-22	Shoreline Assessment	•	•	•	•	Hit of oil on offshore stump. Overhanging vegetation. Also, pooled oil behind stump. Cut vegetation and remove. High volume flush and collect with snare.	High volume flush and collect with snare.	42.35425	-85.29973	(Y) N
EPA-C-0443	SCAT T1 08/31/2010						No actionable items.	42.35401	-85.29975	(Y) N

Printed Team Members Names:

Date:

Comments:

-not flagged in the field, stump at 42.35417, -85.29942 needs absorbent pads/boom as oil is pooling behind it

-not a zone

9/12/10 Team 1
Amanda Bohnenblust
Howard Pham
Ken Mroczkowski

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 24.0-24.25 Right Bank While Looking Downstream										
SCE1-11	Shoreline Assessment	•	•		•	Pooled oil in log jam. Collect with snare and dispose.	Pooled oil in log jam. Collect with snare and dispose.	42.35572	-85.30172	Y / N
EPA-C-0466	SCAT T3 08/31/2010	85.18.001 42.21.2464; GPS coordinates in Degrees Minutes. No oil observed in this segment. Coordinates serve as end of segment.					No actionable item	42.35411	-85.30002	Y / N
EPA-C-707	**NA**	**Light sheen and tar balls observed in mud / sand areas of shore**					**Manual Removal Recommended**	**42.35678**	**-85.30178**	**Y N**

Printed Team Members Names:

Date:

Comments:

this wasn't flagged, however - we looked at the entire shoreline & didn't see any log jams

-not a zone

-no flag in field

9/12/10 Team 1

Amanda Bohnenblust

Howard Phrom

Ken Mroczkowski

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 24.00 to MP 24.25 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature 11-Sept-2010 (date) Enbridge
Ken Costley

Signature 9/11/10 (date) EPA
Eduardo Rivera

4. **SCAT Reassessment**

Signature 9/12/10 (date) Enbridge
Amanda Bonnenblust

Signature Howard Pham 9/12/10. (date) EPA
HOWARD PHAM

Signature 9/12/2010 (date) MDNRE
Kenneth M. Mroczkowski

5. **EPA**

Signature 9/22/10 (date) EPA Division Supervisor
GARY LIPSON

Appendix E
Photographs

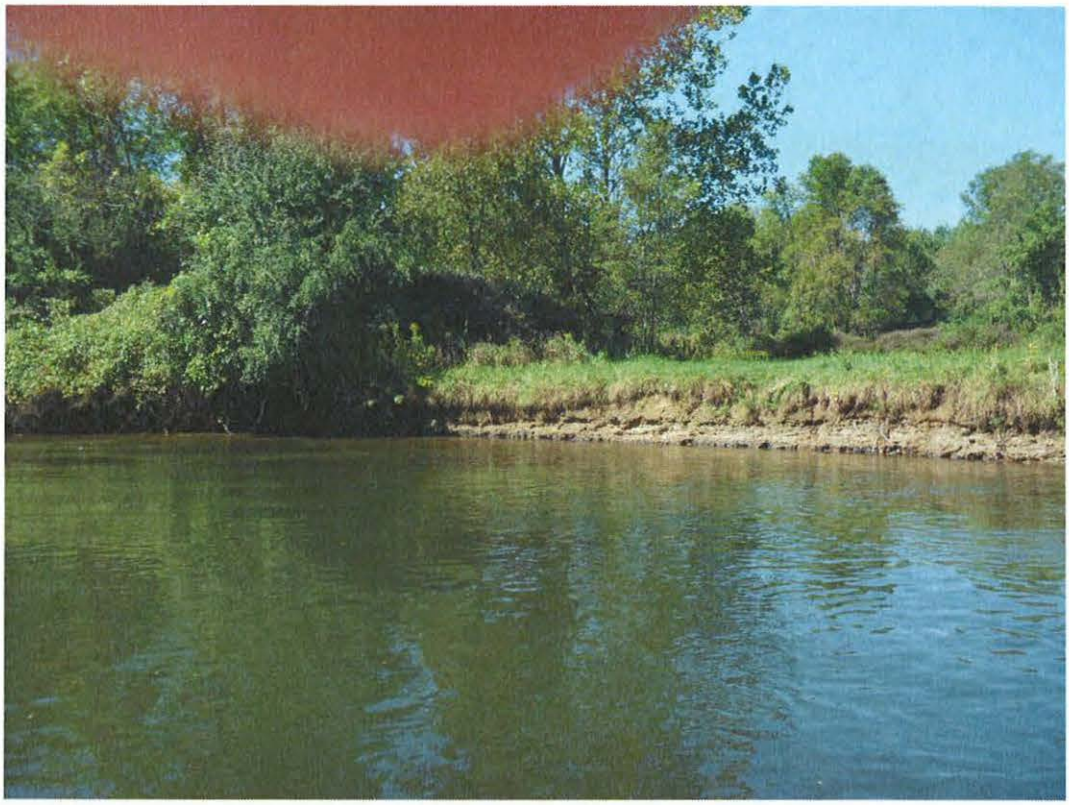


Photo 0377 – Looking north at right descending bank.



Photo 0378 – Looking south at left descending bank.



Photo 0379 – Looking west at right descending bank, near SCE1-11.



Photo 0380 – Looking southeast at left descending bank.



Photo 0381 – Looking south at right descending bank.



Photo 0382 – Looking southeast at left descending bank.

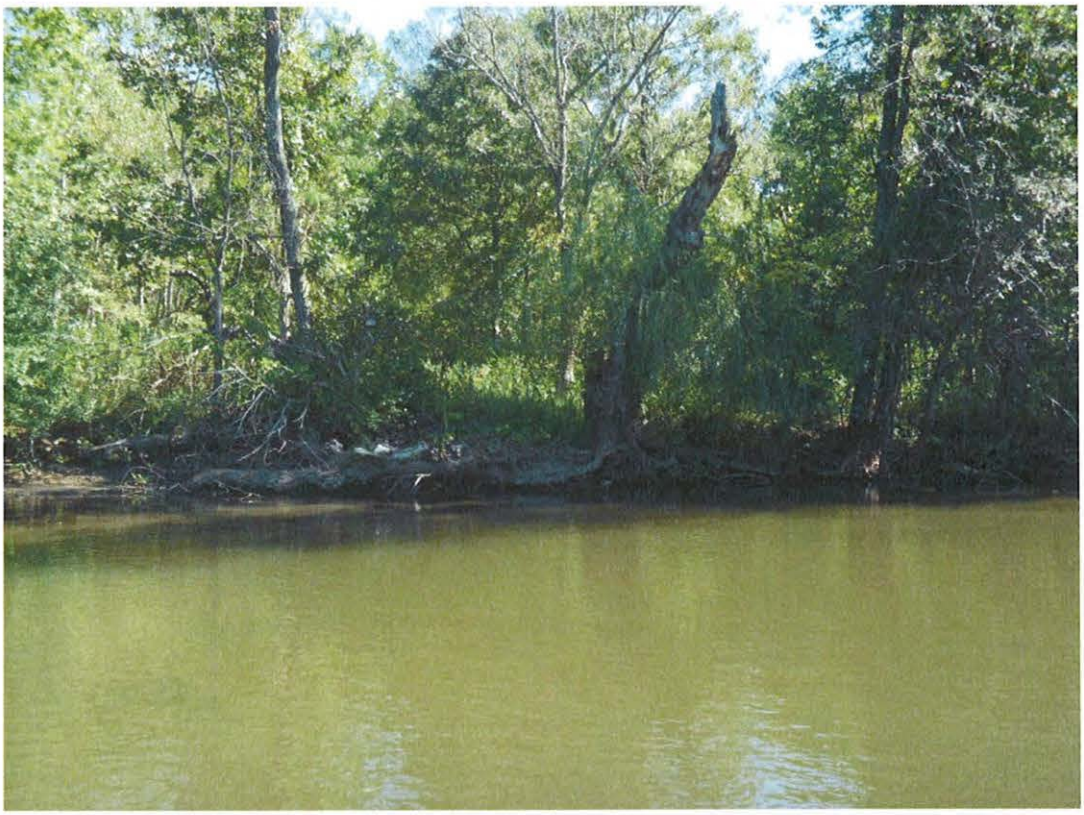


Photo 0383 – Looking east at left descending bank, near SCE1-22.



Photo 0384 – Looking south at left descending bank, near EPA-C-0443.



Photo 0385 – Looking southwest at right descending bank, near EPA-C-0466.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 24.50 – MP 24.25 to 24.50

Enbridge Energy

September 18, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 24.50 had light oiling on the left descending bank with pooled oil and oiled debris. The right descending bank is spotted with oil in places but generally unoiled. The overbank contained no areas requiring clean-up and no islands were present.

Actions

Free oil was recovered from along the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 24.50 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging vegetation;
- High volume low pressure flushing for free oil removal with downstream booming, absorbent booms and pads;
- Removal of oiled debris.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 24.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

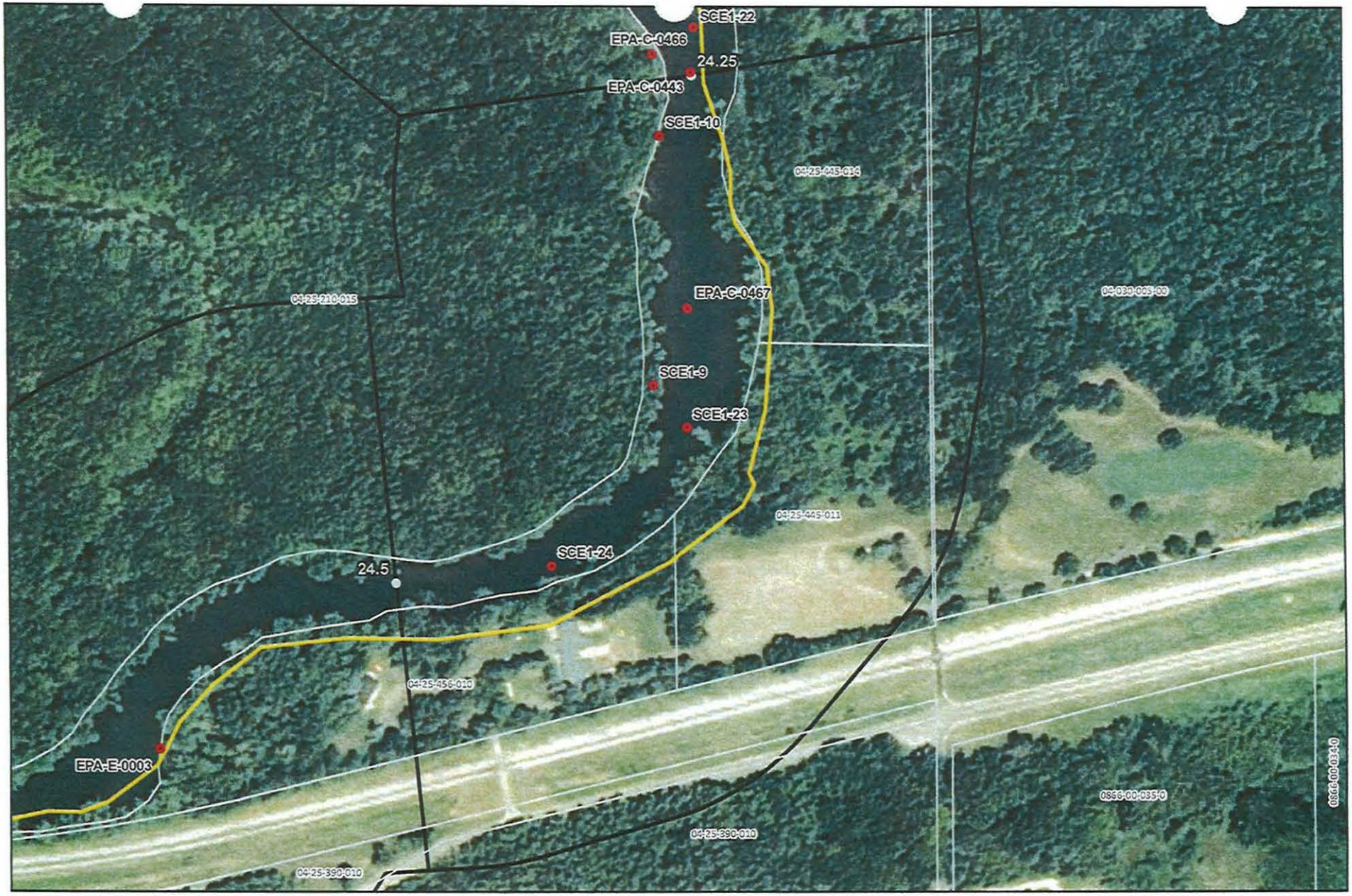
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

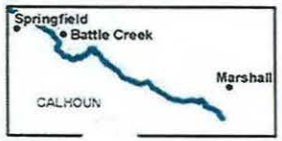
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 24.25-24.5 Left Bank While Looking Downstream										
SCE1-23	Shoreline	Shoreline Assessment	•		•	•	Debris field and oil in log jam. Collect with snare and dispose.	Debris field and oil in log jam. Collect with snare and dispose.	42.35218	-85.29977
SCE1-24	Shoreline	Shoreline Assessment	•	•		•	Log jam with pooled oil. Collect with snare and dispose of residues.	Log jam with pooled oil. Collect with snare and dispose of residues.	42.35147	-85.30070





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 24.25-24.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



24.25 to 24.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

Smart to Earth. Smart to Business.

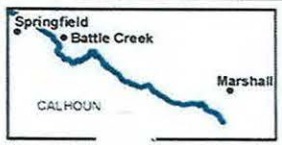
www.entrix.com

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 24.25-24.5 Right Bank While Looking Downstream										
SCE1-10	Shoreline	Shoreline Assessment	•		•		Spotted oil on bank. High volume flush and collect to boom of snare.	Spotted oil on bank. High volume flush and collect to boom of snare.	42.35368	-85.29997
EPA-C-0467	Shoreline	SCAT T3 08/31/2010	85.17.9861 42.21.1679; GPS coordinates for end of segment in Degrees Minutes: 42 degrees 21.0952 85 degrees 18.1024						42.35280	-85.29977





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 24.25-24.5
Right Bank While Looking Downstream

Enbridge Pip[illegible] Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michig[illegible] Feet

SCAT Team 1, No [illegible] Items 8/31/10



24.25 to 24.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

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Appendix B
Step 2 – Clean-Up Operations

MP 24.5

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: Sept. 12 2010 **Time: AM / PM**

Operations Division: E **Segment ID: From** 24.5 **Start MP to End MP** 24.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank:** (LOB)/ROB

Weather: (Sun)/Cloud/Rain/Snow/ 57°

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature] STEVE TURNOR

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Clean up Completed

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Clean up Completed

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-12-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 24.25 **Start MP to End MP** 24.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

After reviewing the SCAT report the LDB had 10 recommended actions and the LDB had 2 areas of concern.
Clean up required is flushing, Pooling and Veg. + debris removal.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected this segment and all is complete according to the SCAT recommendations.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 24.25-24.5 Left Bank While Looking Downstream										
SCE1-23	Shoreline Assessment	•		•	•	Debris field and oil in log jam. Collect with snare and dispose.	Debris field and oil in log jam. Collect with snare and dispose.	42.35218	-85.29977	(Y) / N
SCE1-24	Shoreline Assessment	•	•		•	Log jam with pooled oil. Collect with snare and dispose of residues.	Log jam with pooled oil. Collect with snare and dispose of residues.	42.35147	-85.30070	(Y) / N

Printed Team Members Names: Mike Van Loan, Chris Clampitt, Howard Thom

Date: 9/14/10

Comments:

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 24.25-24.5 Right Bank While Looking Downstream										
SCE1-10	Shoreline Assessment	•		•		Spotted oil on bank. High volume flush and collect to boom of snare.	Spotted oil on bank. High volume flush and collect to boom of snare.	42.35368	-85.29997	(Y) / N
EPA-C-0467	SCAT T3 08/31/2010	85.17.9861 42.21.1679; GPS coordinates for end of segment in Degrees Minutes:□						42.35280	-85.29977	(Y) / N

Printed Team Members Names: Mike Van Loan, Chris Clampitt, Howard Rhem

Date: 9/14/10

Comments: @ SCE1-10 oil/sheen rising out of sediment in boot marks

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

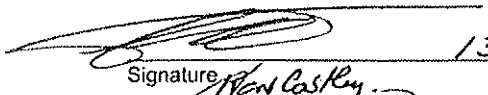
Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 24.25 to MP 24.50 Segment Length: 0.25 mile

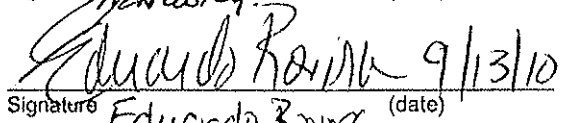
1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

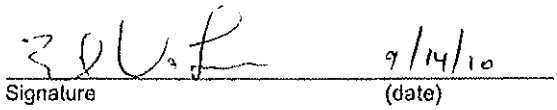


Signature Ryan Casey 13-Sept-2010 (date) Enbridge

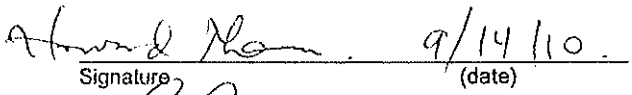


Signature Eduardo Rovira 9/13/10 (date) EPA

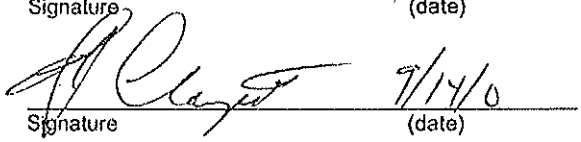
4. **SCAT Reassessment**



Signature 9/14/10 (date) Enbridge

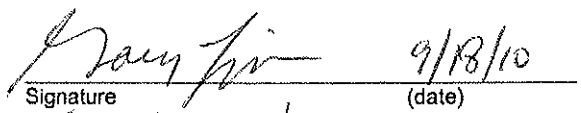


Signature 9/14/10 (date) EPA



Signature 9/14/0 (date) MDNRE

5. **EPA**



Signature Gary Gulp 9/18/10 (date) EPA Division Supervisor

GARY LIPSON

Appendix E
Photographs



Photo 0575 – Looking southwest at right descending bank, near SCE1-10.



Photo 0576 – Looking southeast at left descending bank.



Photo 0577 – Looking southwest at right descending bank, near SCE1-10.



Photo 0578 – Looking west at right descending bank, near SCE1-9.



Photo 0579 – Looking east at left descending bank, near EPA-C-0467.



Photo 0580 – Looking southeast at left descending bank, near SCE1-23.



Photo 0581 – Looking south at left descending bank, near SCE1-24.



Photo 0582 – Looking west at right descending bank.



Photo 0583 – Looking west at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 24.75 – MP 24.50 to 24.75

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 24.75 had light oiling on the left descending bank with oiled vegetation and no oiling was observed on the right descending bank. The overbank contained no areas requiring clean-up and islands were absent. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 24.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

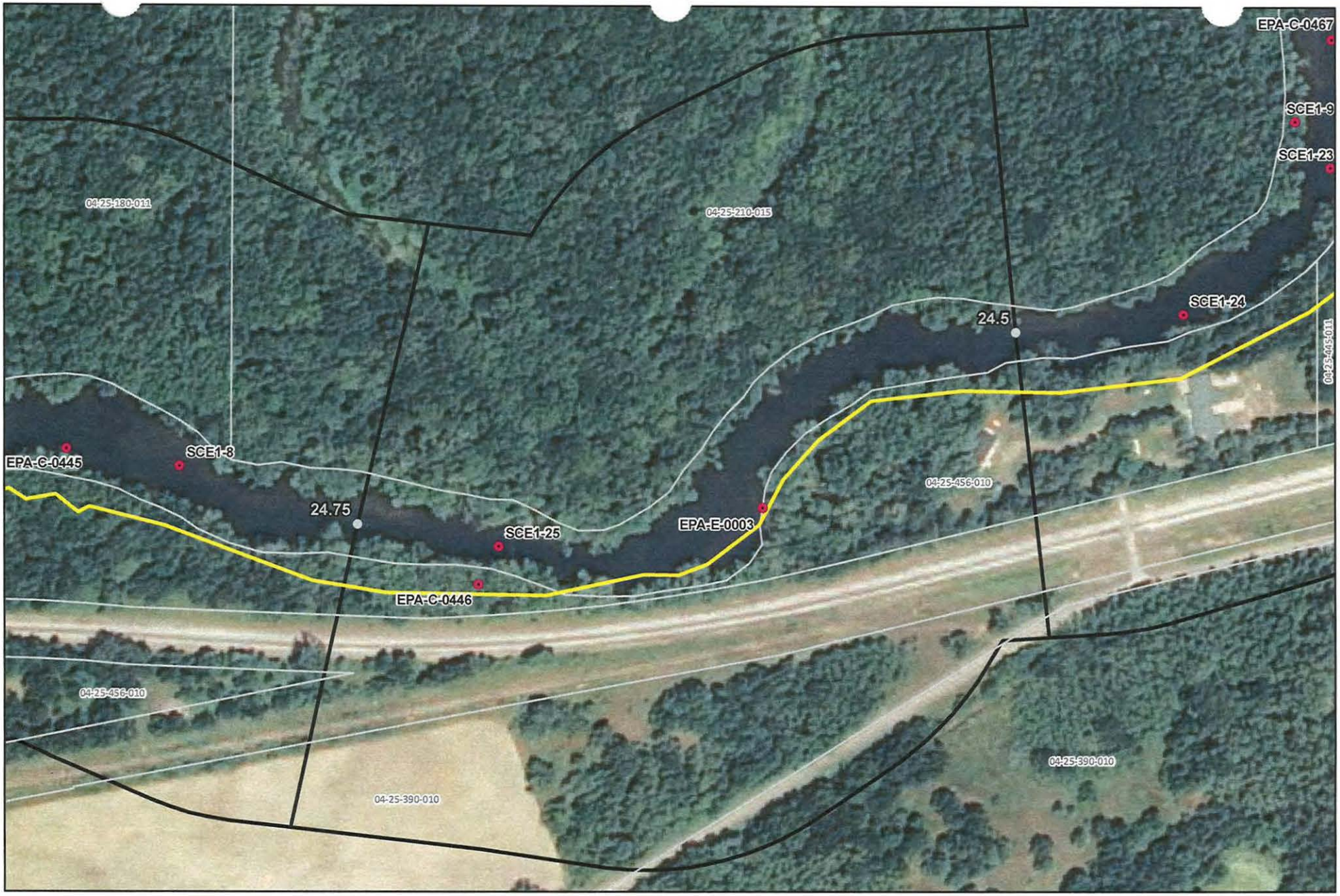
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 24.5-24.75 Left Bank While Looking Downstream										
SCE1-25	Shoreline	Shoreline Assessment			•		Oiled overhanging vegetation (willows). Cut and remove branches.	Oiled overhanging vegetation (willows). Cut and remove branches.	42.35032	-85.30510
EPA-C-0446	Shoreline	SCAT T1 08/31/2010	mp 24.75						42.35013	-85.30523
EPA-E-0003	Shoreline	SCAT T1 8/16/2010	Low area collecting oil, now mousse					Remove	42.35052	-85.30340





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 24.5-24.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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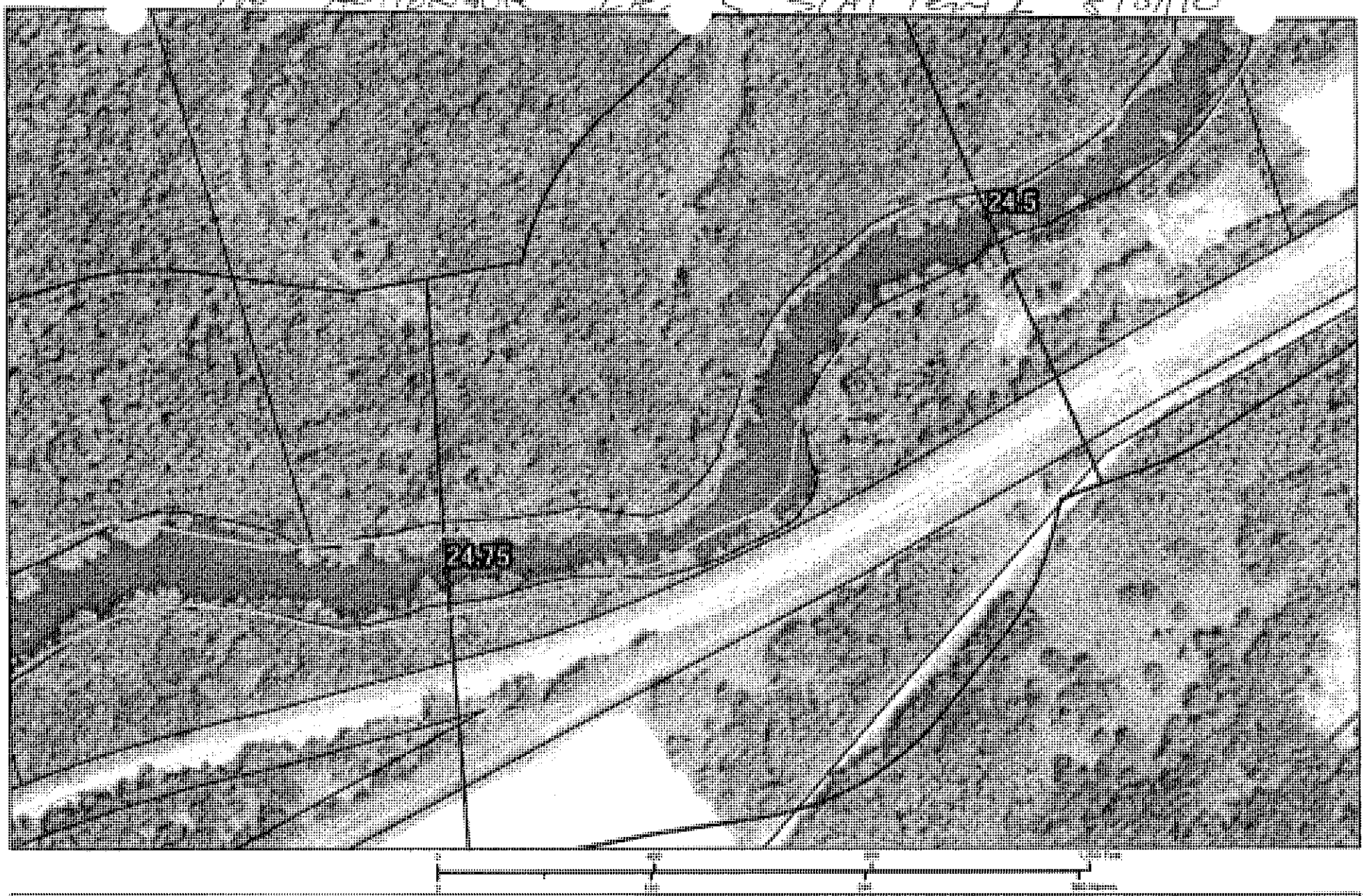
Coordinate System: NAD 1983 State Plane Michigan South Feet



24.5 to 24.75

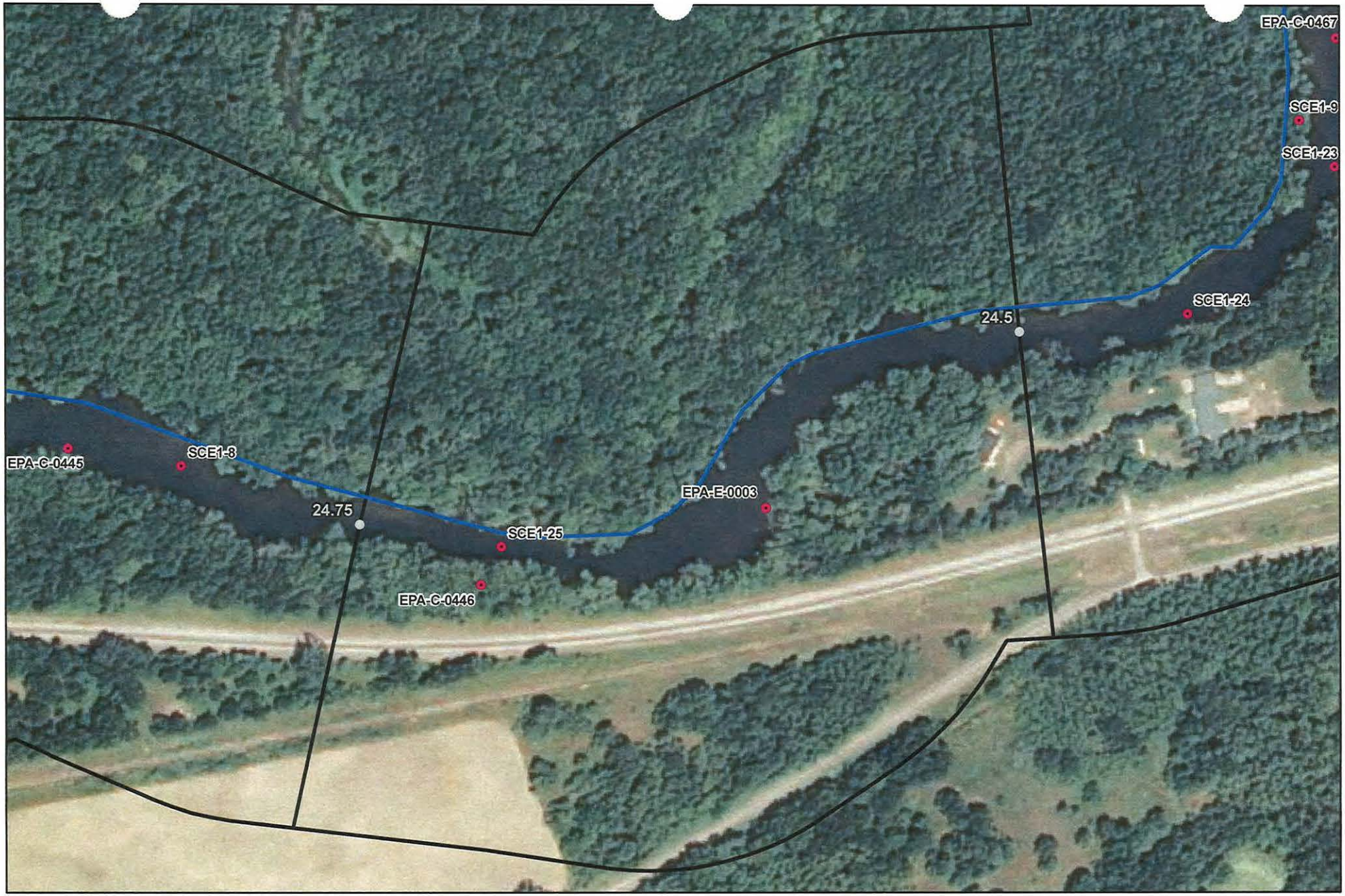
Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 24.5-24.75 Right Bank While Looking Downstream										
							No Operational Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 24.5-24.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

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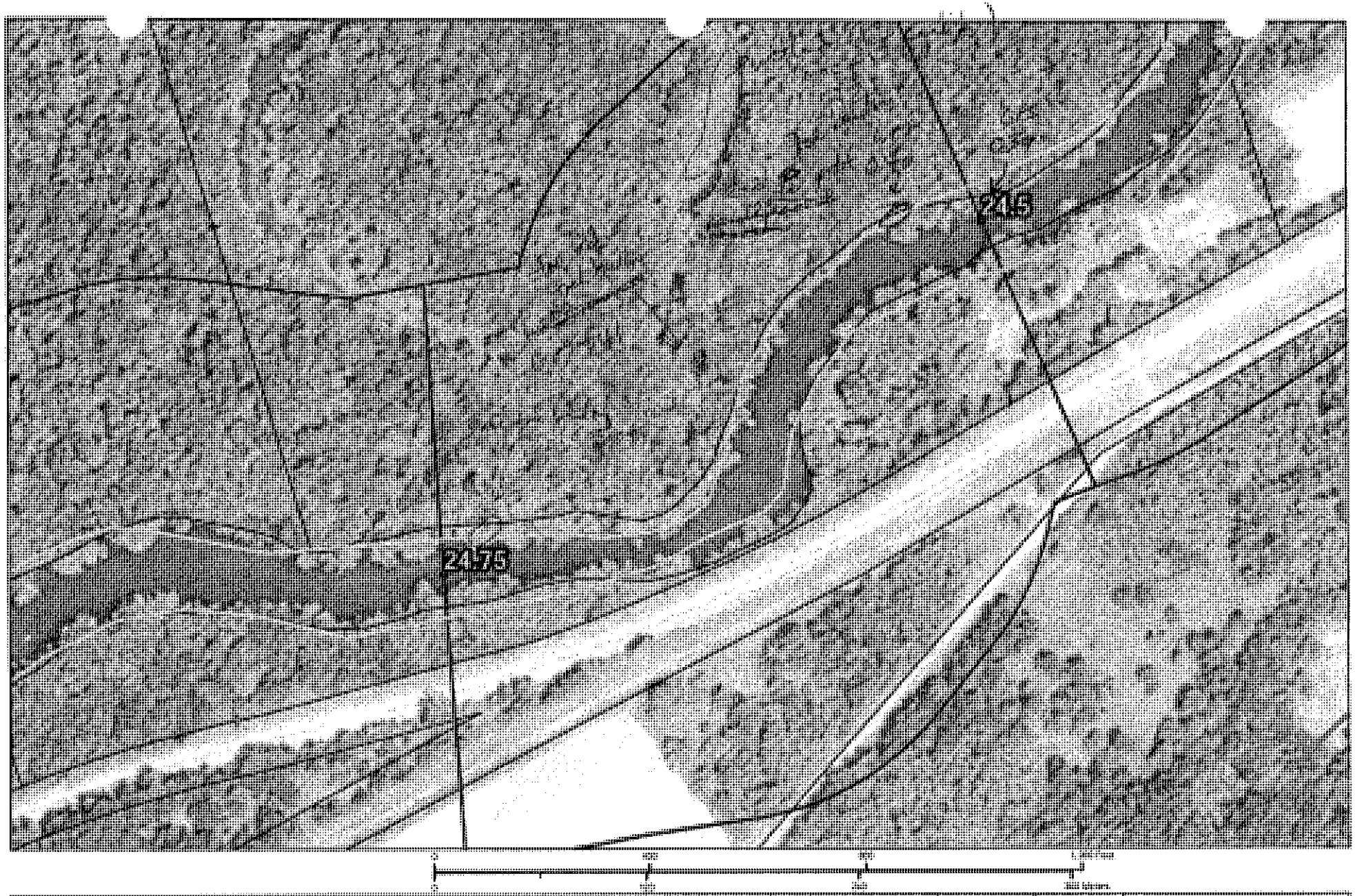
Coordinate System: NAD 1983 State Plane Michigan South Feet



No change Recorded

24.5 to 24.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

No significant oil found during SCAT assessment.

No recommendations or clean-up operations necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

No significant oil found during SCAT assessment.
No recommendations or clean-up operations necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION **Operations Division:_____ Segment ID: From MP** 24.50 **to MP** 24.75 **Segment Length: 0.25 mile**

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Costley (date) 11-Sept-2010 Enbridge

Signature Eduardo Rovira (date) 9/11/10 EPA

4. **SCAT Reassessment**

Signature Amanda Bohnenblust (date) 9/12/10 Enbridge

Signature HOWARD PHAM (date) 9/12/10 EPA

Signature Kenneth M. Mroczkowski (date) 09/12/10 MDNRE

5. **EPA**

Signature GARY LIPSON (date) 9/17/10 EPA Division Supervisor

Appendix E
Photos



Photo 0386 – Looking southwest at left descending bank.



Photo 0387 – Looking west at right descending bank.



Photo 0388 – Looking southeast at left descending bank. Near EPA-E-0003.



Photo 0389 – Looking south at left descending bank. Near EPA-E-0003.



Photo 0390 – Looking west at right descending bank.



Photo 0391 – Looking southwest at left descending bank. Near EPA-C-0446.



Photo 0392 – Looking northwest at right descending bank. Near SCE1-25.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 25.00 – MP 24.75 to 25.00

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 25.00 had light oiling on the left descending bank including an oiled tree in the river and sporadic small tar balls. Only pooled oil was found at a log jam on the right descending bank. The overbank contained no areas of oiling and islands were not present. There were no problematic areas that required special considerations.

Actions

The first activity conducted was recovery of free oil from along the shoreline edge and removal of free oil from behind river flow obstructions as required. The shoreline clean-up activities within Segment 25.00 consisted of the following.

- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads
- Removal of oiled debris

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 25.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

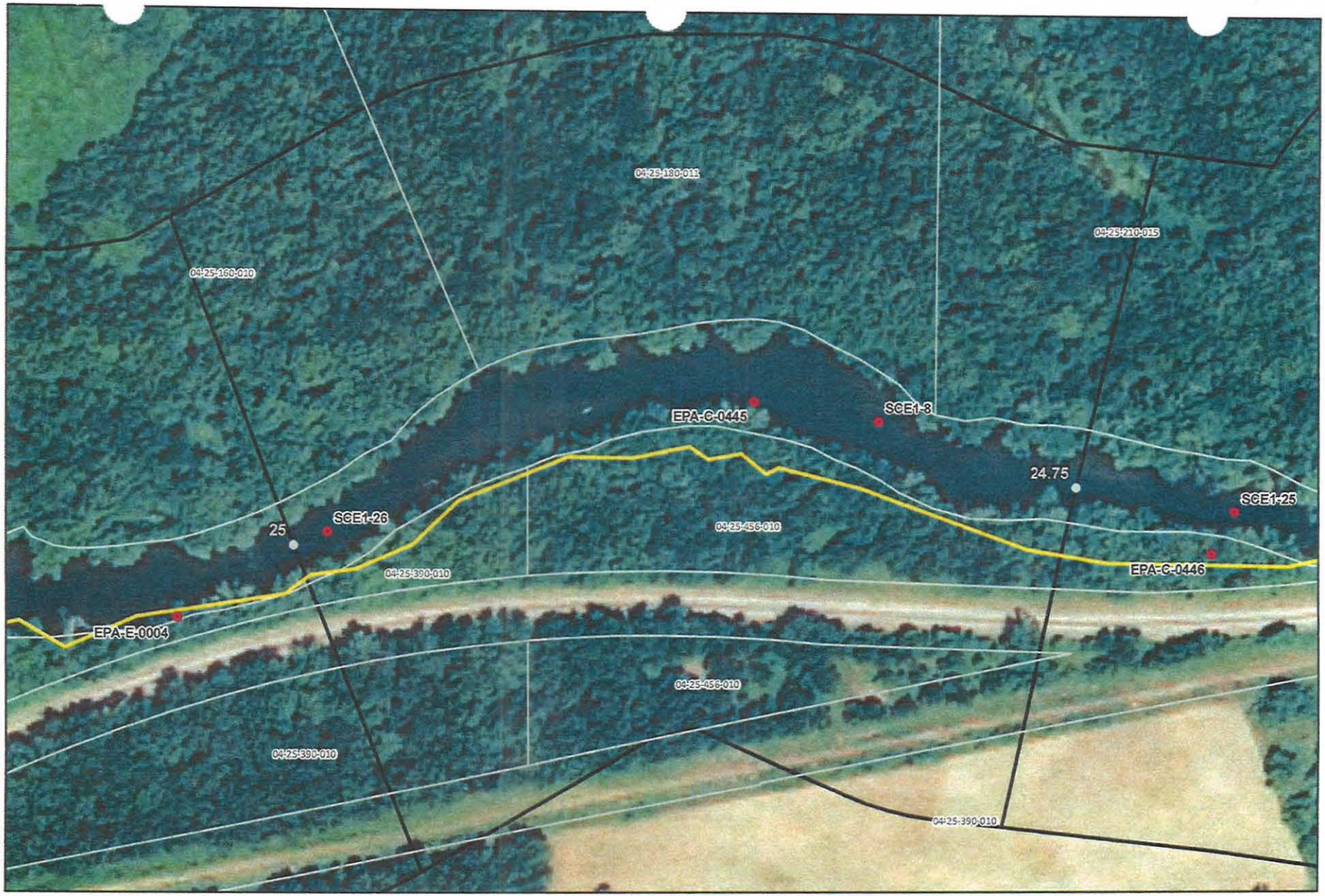
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

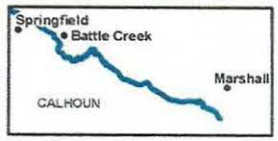
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 24.75-25.0 Left Bank While Looking Downstream										
SCE1-26	Shoreline	Shoreline Assessment	-				Oiled tree laying sideways in river. Wash and collect. Also need to redeploy broken sorbent boom here.	Oiled tree laying sideways in river. Wash and collect. Also need to redeploy broken sorbent boom here.	42.35018	-85.31035
EPA-C-0445	Shoreline	SCAT T1 08/31/2010							42.35076	-85.30789





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 24.75-25
Left Bank While Looking Downstream

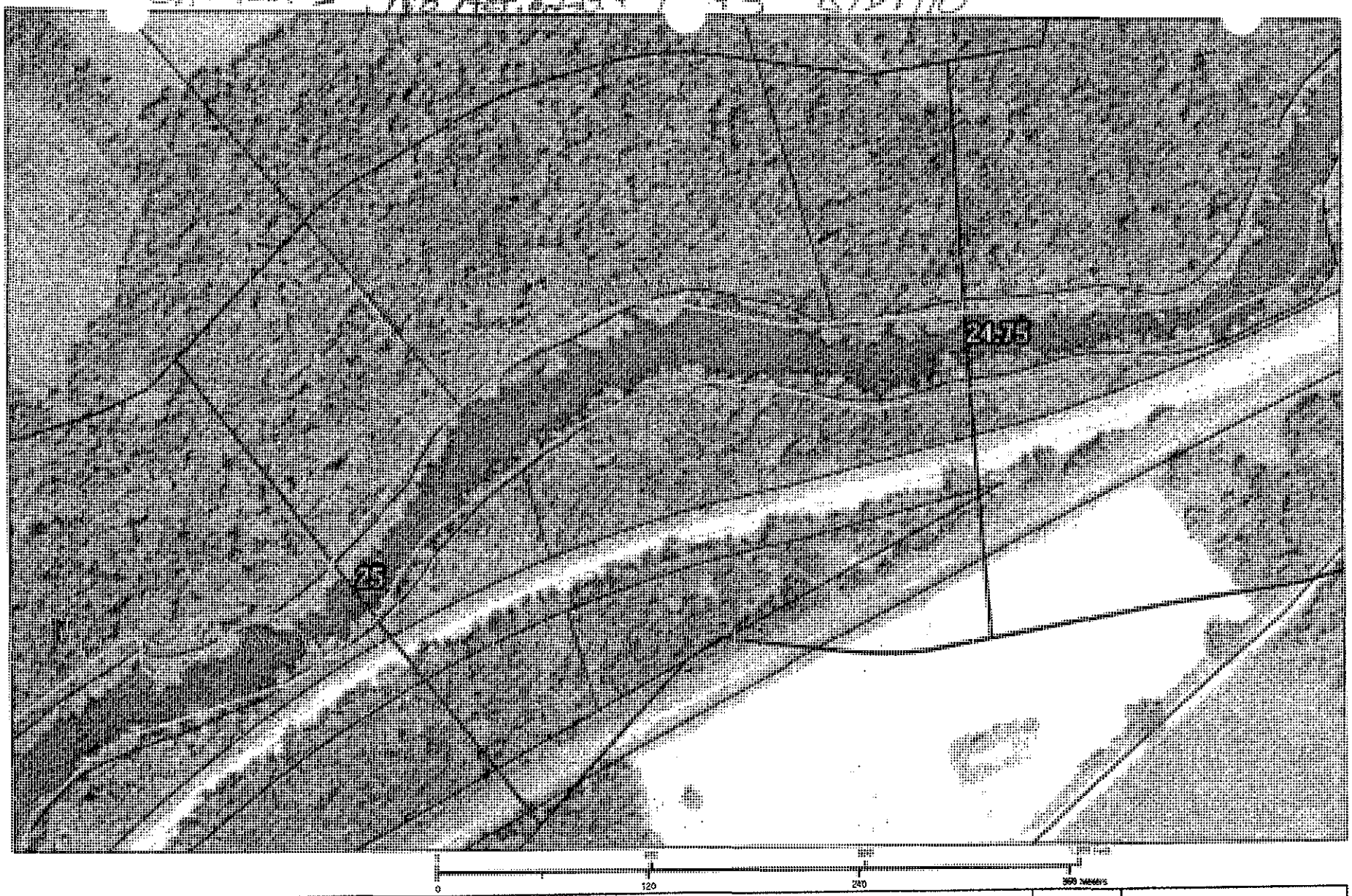
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Quarter Markers
Parcels_1020DIBuffer
Shoreline
River_QuarterMiles
Divisions

24.75 to 25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business.

www.entrix.com

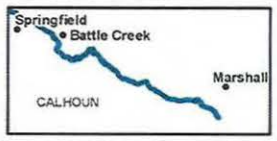
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Enbridge Pipeline Release Ir... nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 24.75-25.0 Right Bank While Looking Downstream										
SCE1-8	Shoreline	Shoreline Assessment	•	•		•	Pooled oil at log jam. Snare and collect.	Pooled oil at log jam. Snare and collect.	42.35068	-85.30717





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 24.75-25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

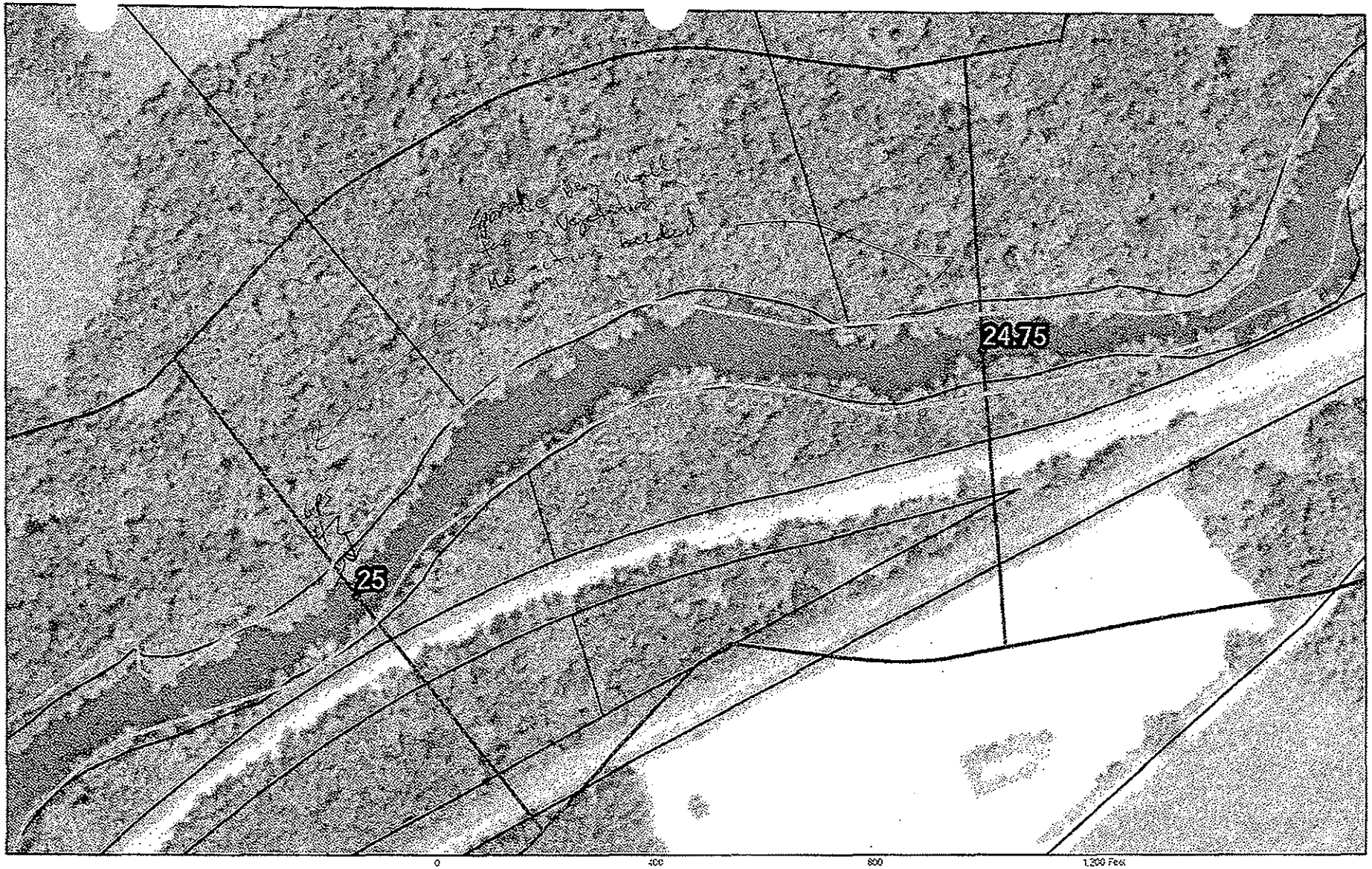
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Team 4
8-31-10

24.75 to 25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

No cleanup recommended

Image: 2009 NAIP

Sheet 7 of 48

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 10-Sept-10 Time: AM / PM

Operations Division: E Segment ID: From 24.75 Start MP to End MP 25.0 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 24°C

Field Inspection Team

Enbridge Inspector: BLR Dave Deren. 10-Sept-10.

Division Supervisor(Contractor): Stan 2 Steve Turnbull

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified Scat points marked green.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Identified SCAT point marked green.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-10-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 24.75 **Start MP to End MP** 25.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Removal 2 areas at certain according to the SCAT report
Clean up required is Flushing, Pooling, debris removal

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected this segment according to the SCAT report
Clean up is complete according to the SCAT report

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

clear

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 24.75-25.0 Left Bank While Looking Downstream										
SCE1-26	Shoreline Assessment	•				Oiled tree laying sideways in river. Wash and collect. Also need to redeploy broken sorbent boom here.	Oiled tree laying sideways in river. Wash and collect. Also need to redeploy broken sorbent boom here.	42.35018	-85.31035	(Y) / N
EPA-C-0445	SCAT T1 08/31/2010	Team cmments are that there is fence (barbed) on shoreline, use caution					No actionable items.	42.35076	-85.30789	(Y) / N
										Y / N
										Y / N
										Y / N

Printed Team Members Names:

Date:

Comments:

-not a zone

Team 1 9/12/10

Amanda Bohnenblust

Ken Moczkowski

Howard Pham

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 24.75-25.0 Right Bank While Looking Downstream										
SCE1-8	Shoreline Assessment	•	•		•	Pooled oil at log jam. Snare and collect.	Pooled oil at log jam. Snare and collect.	42.35068	-85.30717	(Y) N

Printed Team Members Names:

Date:

Comments:

9/12/10 Team 1

Amanda Bohnenblust

Ken Mackoski

Heard from

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 24.75 to MP 25.00 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Cosby 11-Sept-2010 (date) Enbridge

Signature Eduardo Rovira 9/11/10 (date) EPA
Eduardo Rovira

4. **SCAT Reassessment**

Signature Amanda Bohnenblust 9/12/10 (date) Enbridge

Signature Howard Pham 9/12/10 (date) EPA

Signature 9/12/2010 (date) MDNRE
Kenneth M. Mroczkowski

5. **EPA**

Signature GARY LIPSON 9/17/10 (date) EPA Division Supervisor

Appendix E
Photographs



Photo 0393 – Looking west at left descending bank.



Photo 0394 – Looking northwest at right descending bank.



Photo 0395 – Looking north at right descending bank. Near SCE1-8.



Photo 0396 – Looking north at right descending bank. Near SCE1-8.

Field Photo Log – Segment MP 25.00

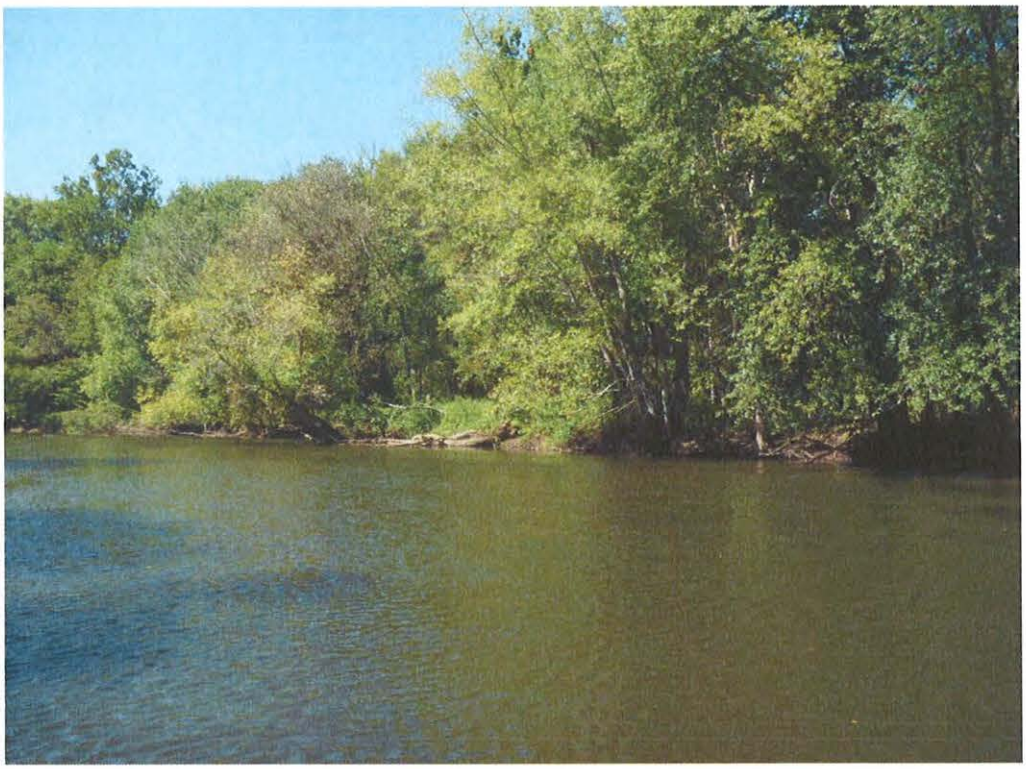


Photo 0397 – Looking northwest at right descending bank.



Photo 0398 – Looking southwest at left descending bank. Near EPA-C-0445.

Field Photo Log – Segment MP 25.00



Photo 0399 – Looking south at left descending bank. Near SCE1-26.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 25.25 – MP 25.00 to 25.25

Enbridge Energy

September 16, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 25.25 had light oiling on the left descending bank and no oiling observed on the right descending bank. The overbank contained no areas requiring clean-up and islands were absent. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 25.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

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C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

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Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

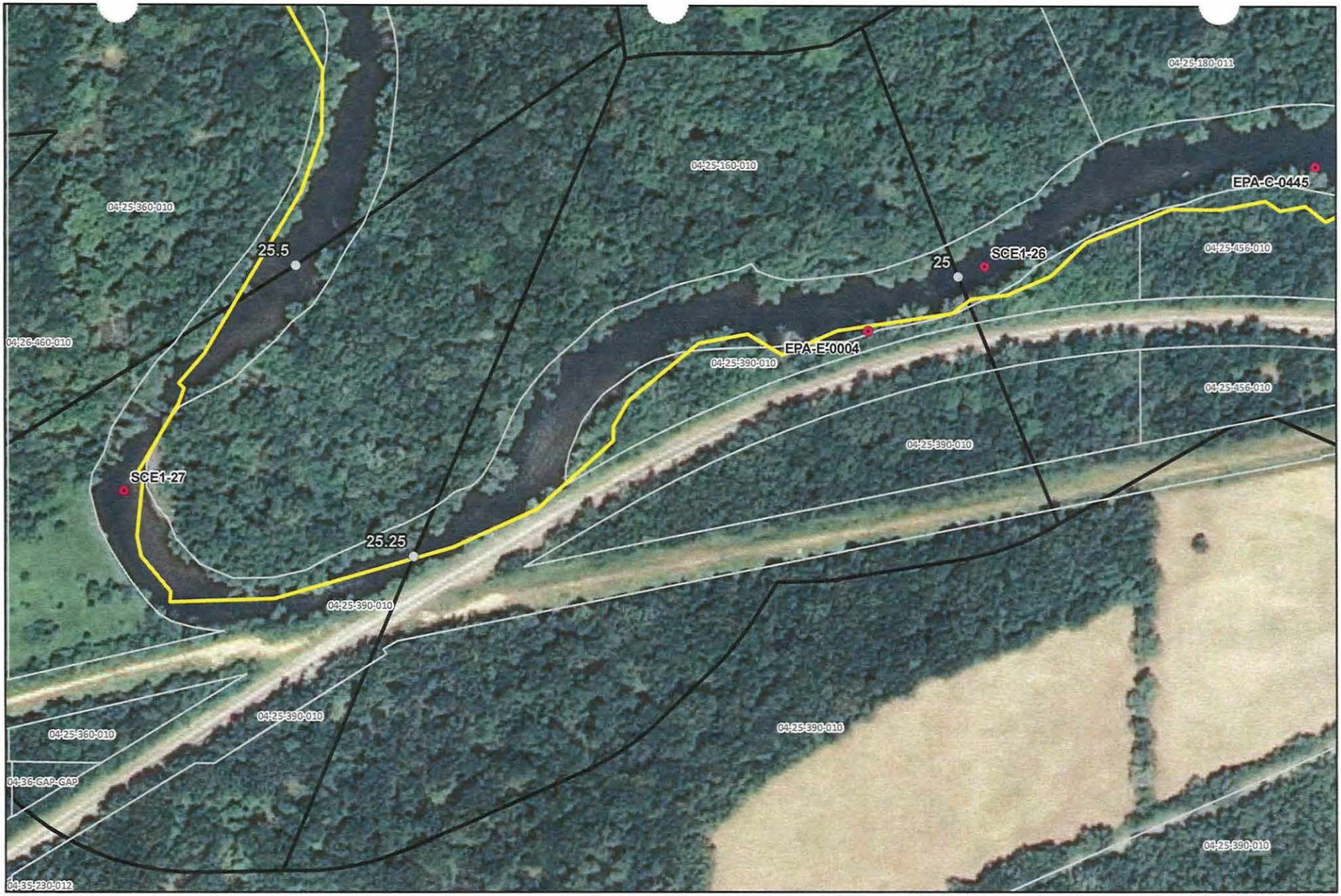
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In. .nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 25.0-25.25 Left Bank While Looking Downstream										
							No Operational Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 25-25.25
Left Bank While Looking Downstream

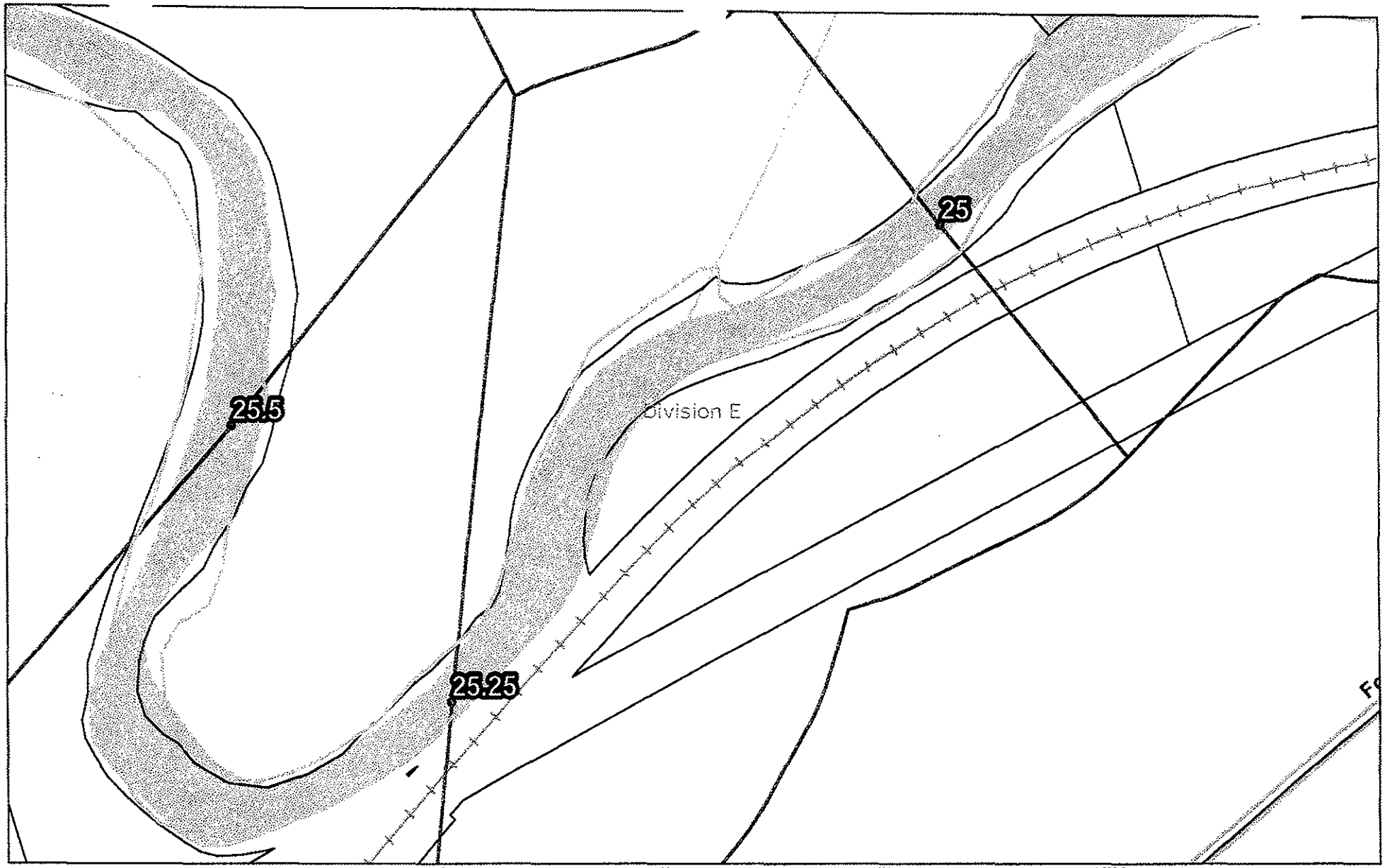
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuarterMileMarkers
Parcels_102000Buffer
Shoreline
River_QuarterMiles
Divisions

TEAM 1
9/1/10

NO OIL FOUND

25 to 25.25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FIPS

Enbridge Pipeline Release Ir. nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 25.0-25.25 Right Bank While Looking Downstream										
							No Operational Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 24.75-25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

No significant oil found during SCAT assessment.

No recommendations or clean-up operations necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

No significant oil found during SCAT assessment.
No recommendations or clean-up operations necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 25.0 **to MP** 25.25 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK	8-30-10 (date)	Enbridge
Signature MJ MALPILSKI	30 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Karen Van Tiem	9-7-10 (date)	Enbridge Glenn Vorde Water 9/7/10 Glenn Vorde Water
Signature Kathleen M. Foley	9-7-10 (date)	EPA L. Leonova LARISA LEONOVA 9/7/10
Signature MATT WESENER	9/8/10 (date)	MDNRE Ernie Sarkipato

5. **EPA**

Signature GARY LIPSON	9/17/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0400 – Looking southwest at left descending bank.



Photo 0401 – Looking northwest at right descending bank.



Photo 0402 – Looking southwest at left descending bank. Near EPA-E-0004.



Photo 0403 – Looking west at right descending bank.



Photo 0404 – Looking southwest at left descending bank.



Photo 0405 – Looking west at right descending bank.



Photo 0406 – Looking southwest at left descending bank.



Photo 0407 – Looking west at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 25.50 – MP 25.25 to 25.50

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 25.50 had light oiling, oiled debris and oiled vegetation on the left descending bank. The right descending bank had very light oiling on the right descending bank. The overbank contained no areas requiring clean-up. There were no islands present within the river channel.

Actions

The shoreline clean-up activities within Segment 25.50 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs;
- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads;
- Removal of oiled debris.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 25.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

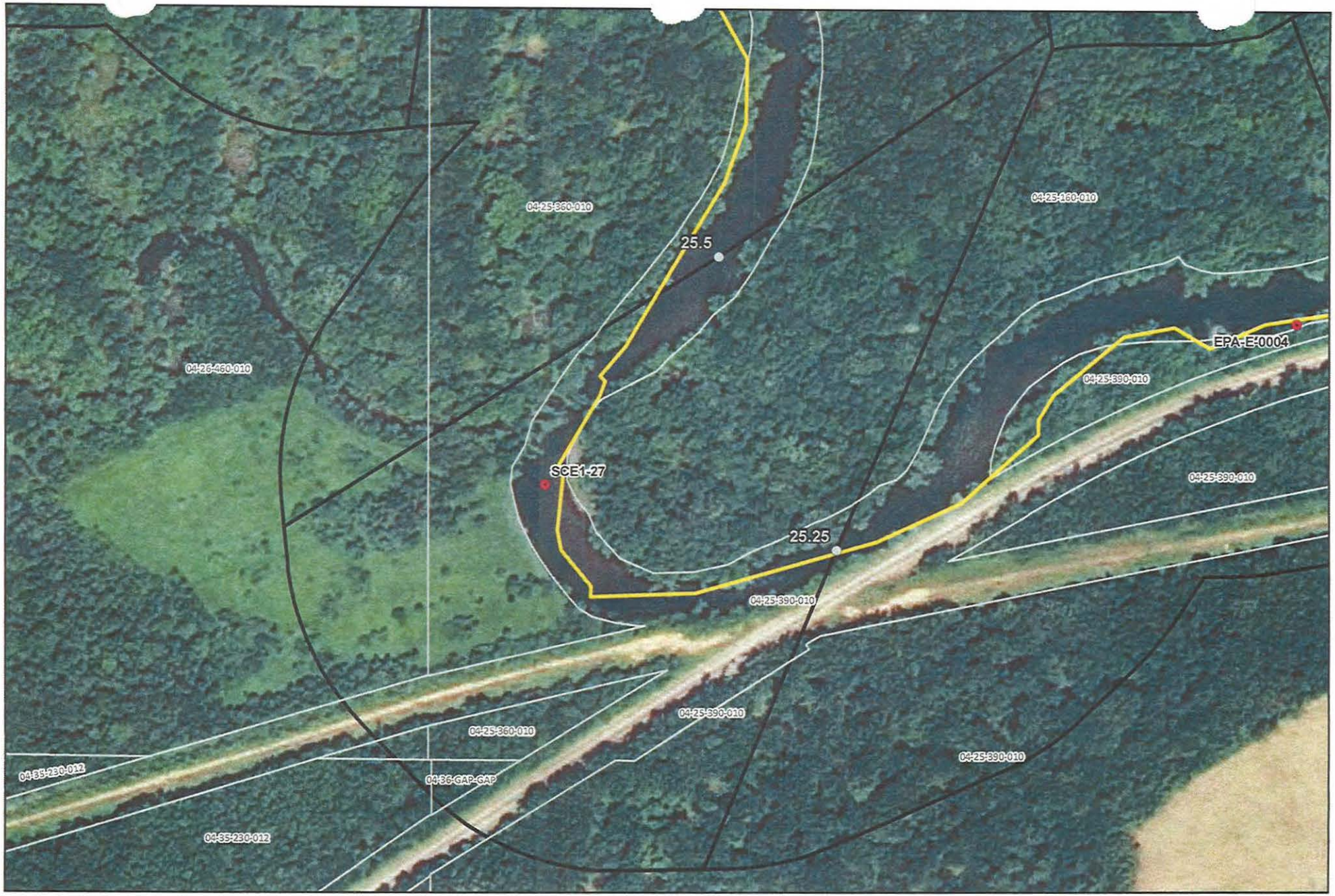
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

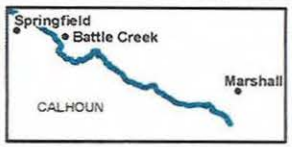
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 25.25-25.5 Left Bank While Looking Downstream										
SCE1-27	Shoreline	Shoreline Assessment	•		•	•	Debris field with oil stained/coated wood. Oiled vegetation overhanging. Cut and remove. Cut and/or flush oil on wood to snare.	Oiled vegetation overhanging. Cut and remove. Cut and/or flush oil on wood to snare.	42.34888	-85.31677





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 25.25-25.5
Left Bank While Looking Downstream

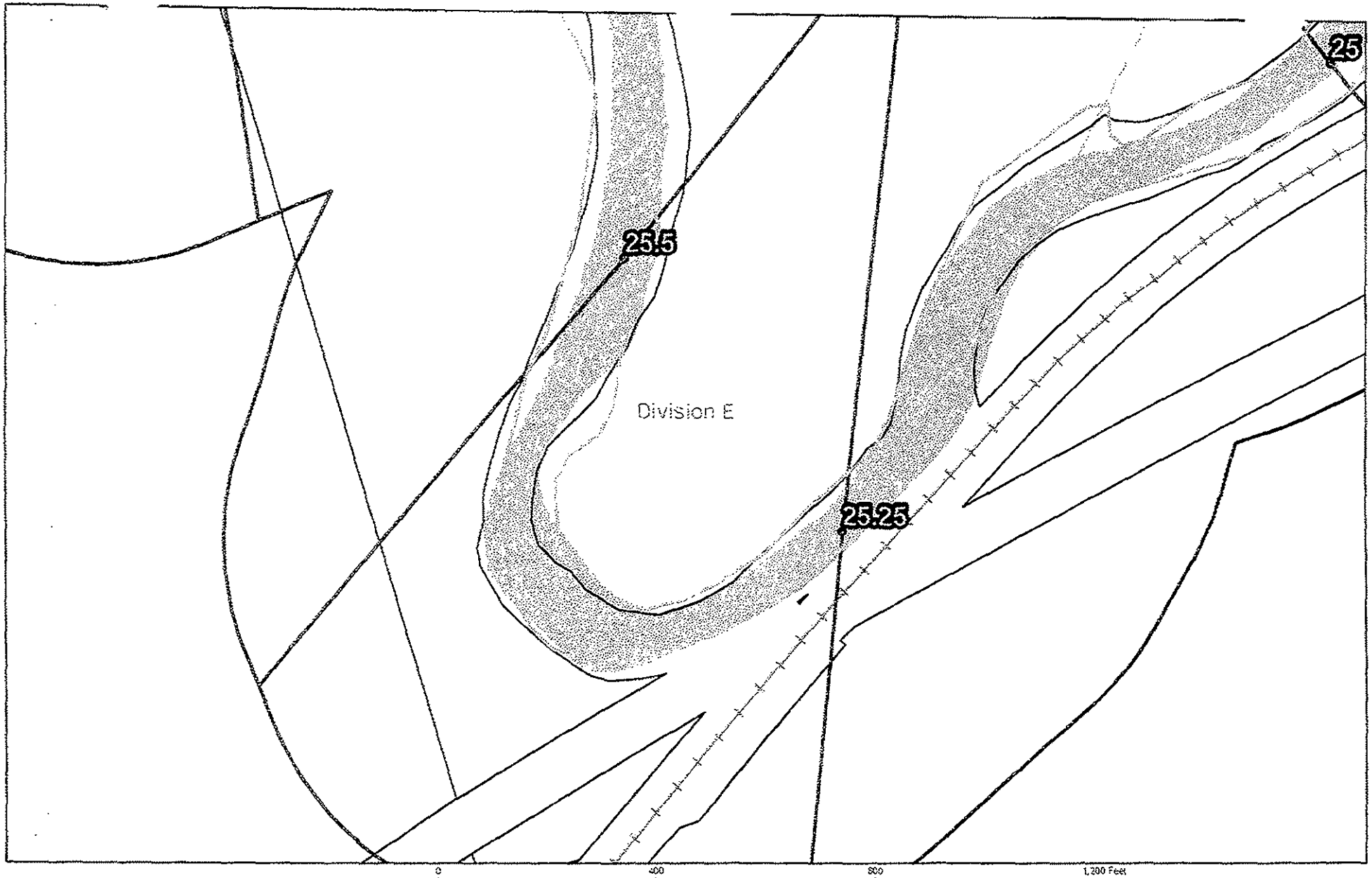
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Quantum Markers
Parcels_1o2oldBuffer
Shoreline
River_Quantum Miles
Divisions

TEAM 1
9/1/10

NO OIL FOUND

25.25 to 25.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business.

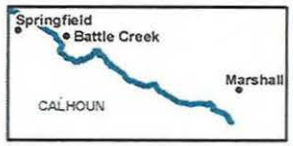
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 25.25-25.5 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 25.25-25.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

15.5

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: Sept. 12. 2016 **Time: AM / PM**

Operations Division: E **Segment ID: From** 25.5 **Start MP to End MP** 25.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: (Sun)/Cloud/Rain/Snow/ 57°

Field Inspection Team

Enbridge Inspector: Dan Zimmer

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Clean up completed

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

clean up completed

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-12-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 25.25 **Start MP to End MP** 25.5 **Segment Length: 0.25 mile**

Bank: LDB / ~~RDB~~ ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

[redacted]

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

After reviewing the SCAT report the RDB had no recommended actions and the LDB had one area of concern. Clean up required is flotsam, veg & debris removed and over hanging vegetation.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected this section and all clean up is complete according to the SCAT recommendations

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 25.25-25.5 Left Bank While Looking Downstream										
SCE1-27	Shoreline Assessment	•		•	•	Debris field with oil stained/coated wood. Oiled vegetation overhanging. Cut and remove. Cut and/or flush oil on wood to snare.	Oiled vegetation overhanging. Cut and remove. Cut and/or flush oil on wood to snare.	42.34888	-85.31677	(Y) N

Printed Team Members Names: Mike Van Loan, Chris Claypitt, Howard Phan

Date: 9/19/10

Comments:

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 25.25-25.5 Right Bank While Looking Downstream										
					No Operational Focus Areas Identified					Y / N
										Y / N
										Y / N
										Y / N
										Y / N

Printed Team Members Names: Mike Van Loan, Chris Claycomb, Howard Phan

Date: 9/14/10

Comments:

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

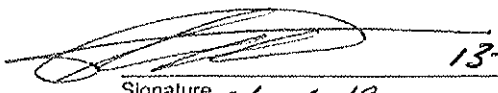
Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 25.25 **to MP** 25.50 **Segment Length: 0.25 mile**

1. **SCAT** ☑

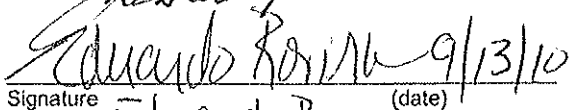
2. **Clean up** ☑

3. **Inspection**



13-Sept-2010 Enbridge
Signature (date)

Ken Gosley



9/13/10 EPA
Signature (date)

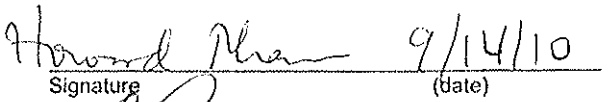
Eduardo Rovira

4. **SCAT Reassessment**



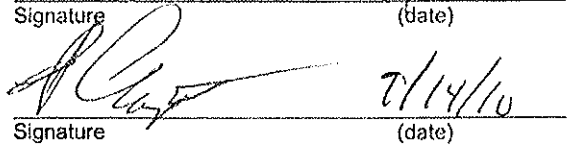
9/14/10 Enbridge
Signature (date)

Michael Van Loan



9/14/10 EPA
Signature (date)

Howard Rhea



9/14/10 MDNRE
Signature (date)

5. **EPA**



9/20/10 EPA Division Supervisor
Signature (date)

GARY LIPSON

Appendix E
Photographs



Photo 0584 – Looking west at right descending bank.



Photo 0585 – Looking south at left descending bank.



Photo 0586 – Looking west at right descending bank.



Photo 0587 – Looking south at left descending bank.



Photo 0588 – Looking west at right descending bank.



Photo 0589 – Looking south at left descending bank.



Photo 0590 – Looking northwest at right descending bank.



Photo 0591 – Looking northwest at left descending bank, near SCE1-27.



Photo 0592 – Looking west at left descending bank.



Photo 0593 – Looking west at left descending bank.



Photo 0594 – Looking north at right descending bank.



Photo 0595 – Looking north at right descending bank.



Photo 0596 – Looking northwest at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 25.75 – MP 25.50 to 25.75

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 25.75 had light oiling on the left descending bank and very light oiling on the right descending bank. The overbank contained no areas requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 25.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

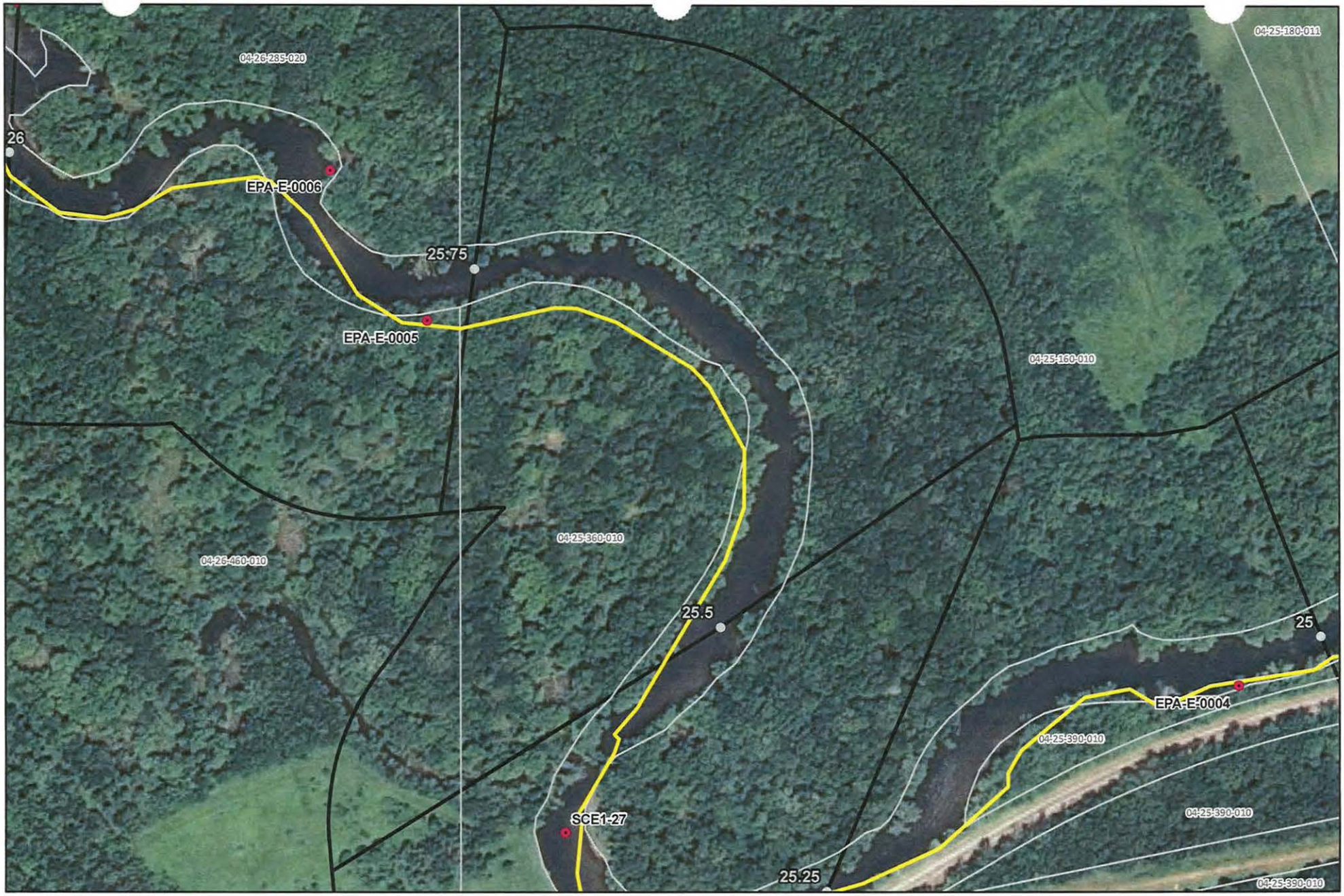
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

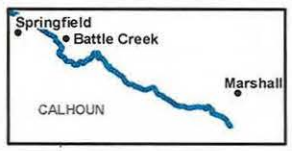
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Ir. nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 25.5-25.75 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 25.5-25.75
Left Bank While Looking Downstream

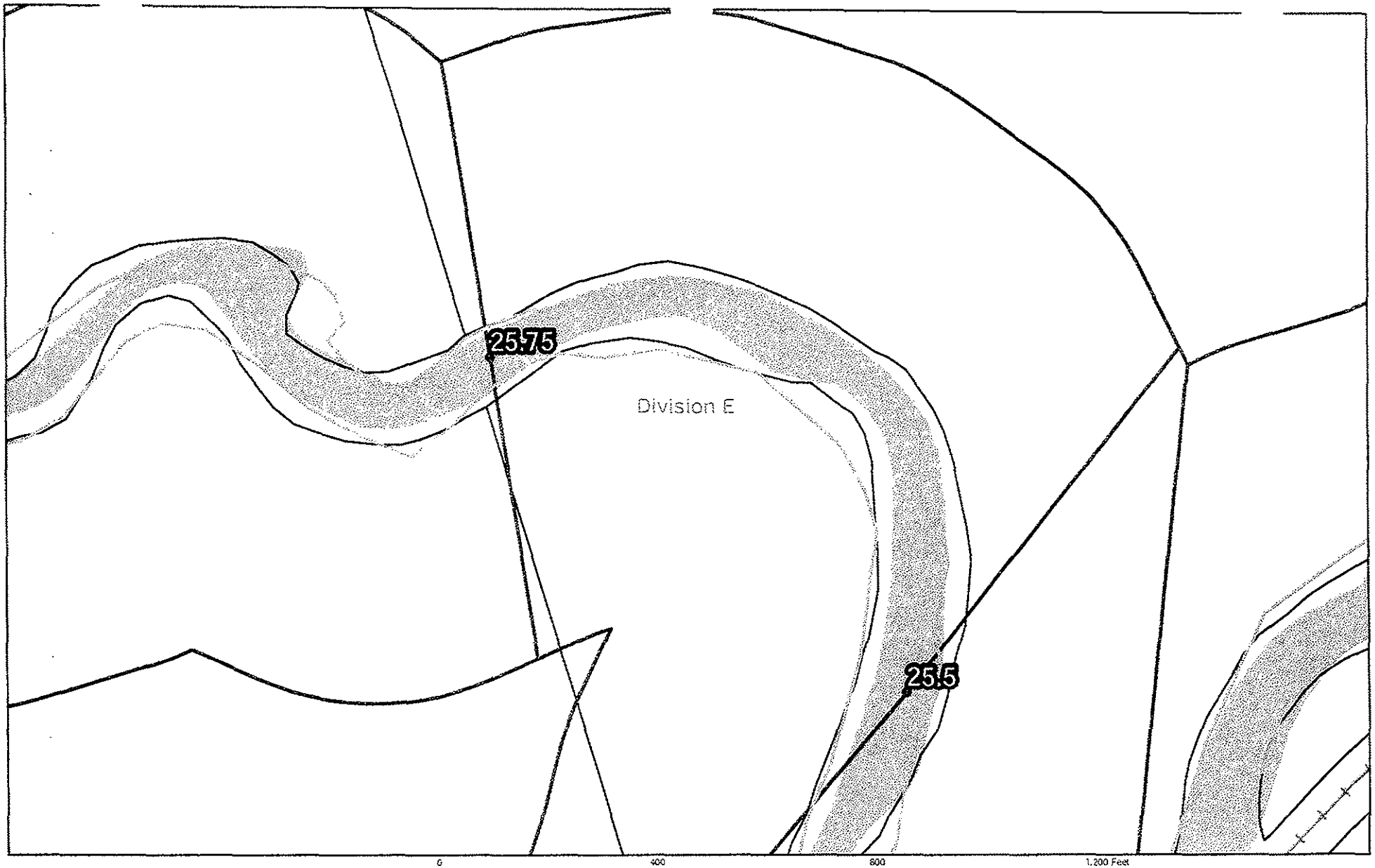
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuarterMileMarkers
Parcels_1020ftBuffer
Shoreline
River_QuarterMiles
Divisions

TEAM 1
9/1/10

NO OIL FOUND
25.5 to 25.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

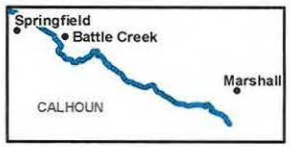
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 25.5-25.75 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 25.5-25.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 25.5 **to MP** 25.75 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK	8-30-10 (date)	Enbridge
MJ Nalepinski Signature MJ NALEPINSKI	30 Aug 10 (date)	EPA

4. **SCAT Reassessment**

Karen Van Tiem Signature Karen Van Tiem	9-7-10 (date)	Enbridge Glenn Vande Water 9/7/10 Glenn Vande Water
Kathleen M. Foley Signature Kathleen M. Foley	9-7-10 (date)	EPA L. Leonova LARISA LEONOVA 9/7/10
Signature MATT WESENER	9/8/10 (date)	MDNRE Ervin Sarkipato 9/8/10

5. **EPA**

Signature GARY LIPSON	9/7/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0408 – Looking northeast at right descending bank.



Photo 0409 – Looking northwest at left descending bank.



Photo 0410 – Looking north at right descending bank.



Photo 0411 – Looking northwest at left descending bank.



Photo 0412 – Looking southwest at left descending bank.



Photo 0413 – Looking northwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 26.00 – MP 25.75 to 26.00

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 26.00 had light oiling on the left descending bank and very light oiling on the right descending bank. The overbank contained no areas requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 26.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

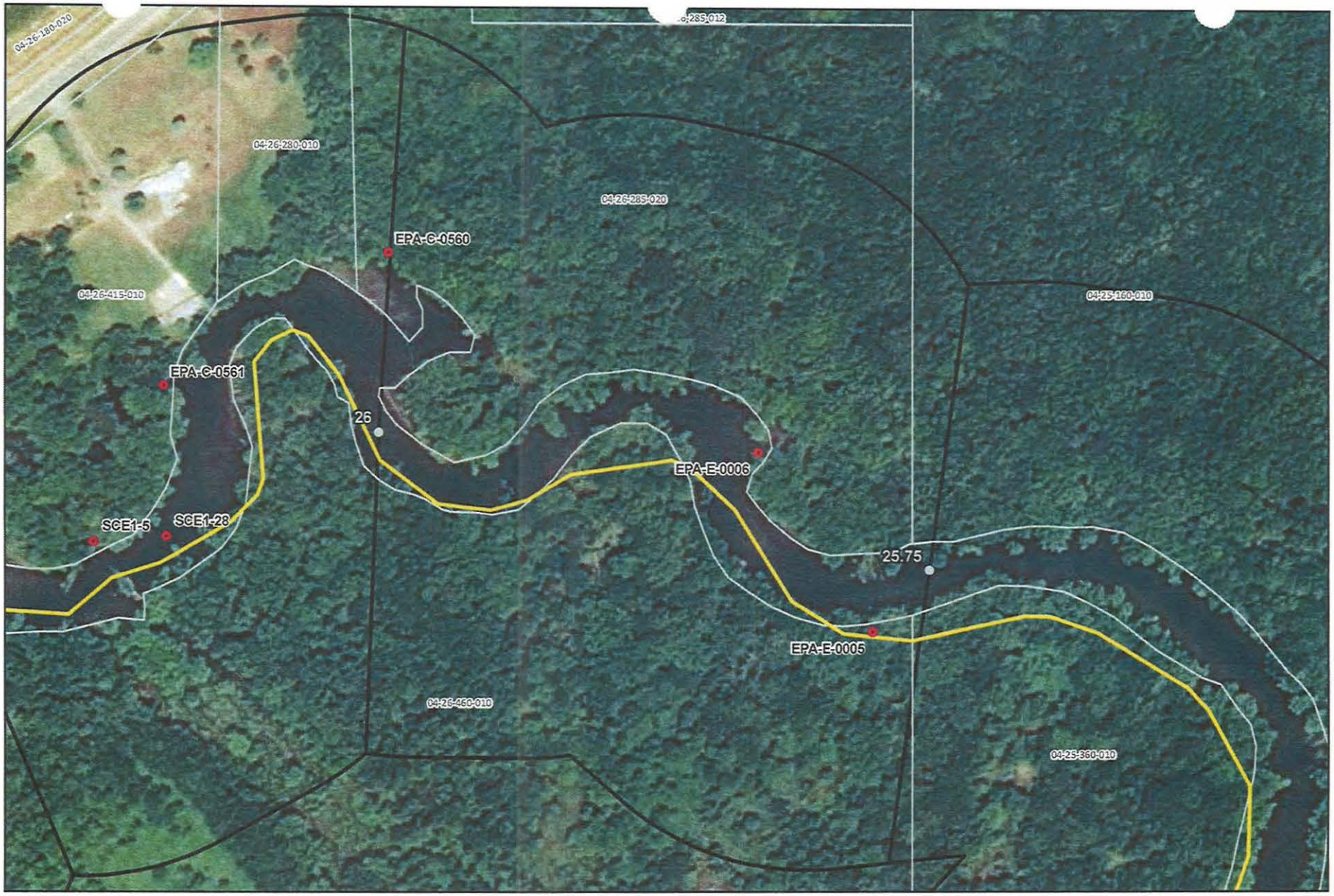
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release fr... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 25.75-26.0 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			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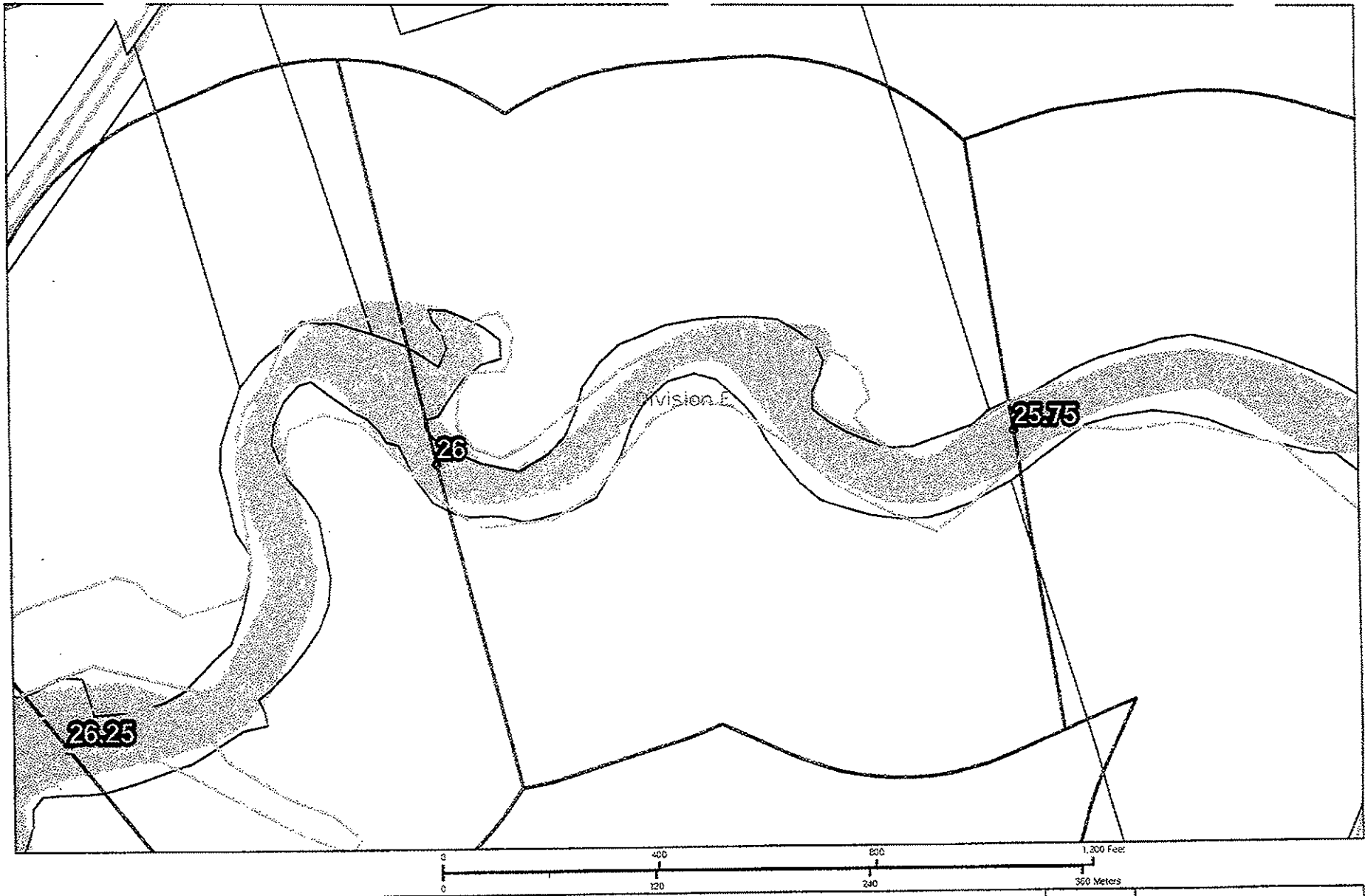
04-26-280-010
04-26-285-020
EPA-C-0560
04-26-415-010
04-25-160-010
EPA-C-0561
26
EPA-E-0006
SCE1-5
SCE1-28
25.75
EPA-E-0005
04-26-460-010
04-25-360-010
Springfield
Battle Creek
Marshall
CALHOUN
River Quarter Miles
Operational Focus Area
Pooled Oil
Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
Division E: Mile Marker 25.75-26
Left Bank While Looking Downstream
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill
0 75 150
Feet
Source: Aerial Photography: USDA, 2009.
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



QuarterMileMarkers
Parcels_10200dBuffer
Shoreline
River_Quarterfiles
Divisions

TEAM 1
9/1/10

NO OIL FOUND

25.75 to 26

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

ENTRIX
Down to Earth, Down to Business

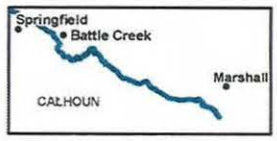
www.entrix.com

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 25.75-26.0 Right Bank While Looking Downstream										
EPA-E-0006	Shoreline	SCAT T1 8/16/2010					Inland pool with a mousse/surface oil residue film	No further action required	42.35292	-85.31877





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 25.75-26
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 25.75 Start MP to End MP 26.00 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From** 25.75 **Start MP to End MP** 26.00 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor):

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION **Operations Division:** E **Segment ID: From MP** 25.75 **to MP** 26.0 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

[signature] 8-30-10 Enbridge
Signature CHRISTOPHER HAUK (date)

[signature] 30 Aug '10 EPA
Signature (date)
MJ NALIPINSKI

4. **SCAT Reassessment**

Karen Van Tien 9-7-10 Enbridge Glenn Vande Water 9/7/10
Signature Karen Van Tien (date)

Kathleen M. Foley 9-7-10 EPA Larisa Leonova
Signature (date) LARISA LEONOVA 9/7/10
Kathleen M. Foley

[signature] 9/8/10 MDNRE Ernie Sarkipato
Signature (date) [signature] 9/8/10
MATT WESENER

5. **EPA**

[signature] 9/17/10 EPA Division Supervisor
Signature (date)
GARY LIPSON

Appendix E
Photographs



Photo 0414 – Looking southwest at left descending bank. Near EPA-E-0005.



Photo 0415 – Looking west at right descending bank.



Photo 0416 – Looking west at left descending bank.



Photo 0417 – Looking northwest at right descending bank.



Photo 0418 – Looking east at right descending bank. Near EPA-E-0006.



Photo 0419 – Looking northwest at right descending bank.

Field Photo Log – Segment MP 26.00



Photo 0420 – Looking west at left descending bank.



Photo 0421 – Looking west at left descending bank.

Field Photo Log – Segment MP 26.00



Photo 0422 – Looking north at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 26.25 – MP 26.00 to 26.25

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 26.25 had light oiling with oiled debris on the left descending bank. The overbank contained no areas requiring clean-up and islands were absent. Very light oiling with staining of a man-made rock wall was observed on the right descending bank.

Actions

The shoreline clean-up activities within Segment 26.25 consisted of the following:

- High volume low pressure flushing for free oil removal with downstream booming and absorbent booms and pads;
- Removal of oiled debris;
- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 26.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Doeumentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addresses

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

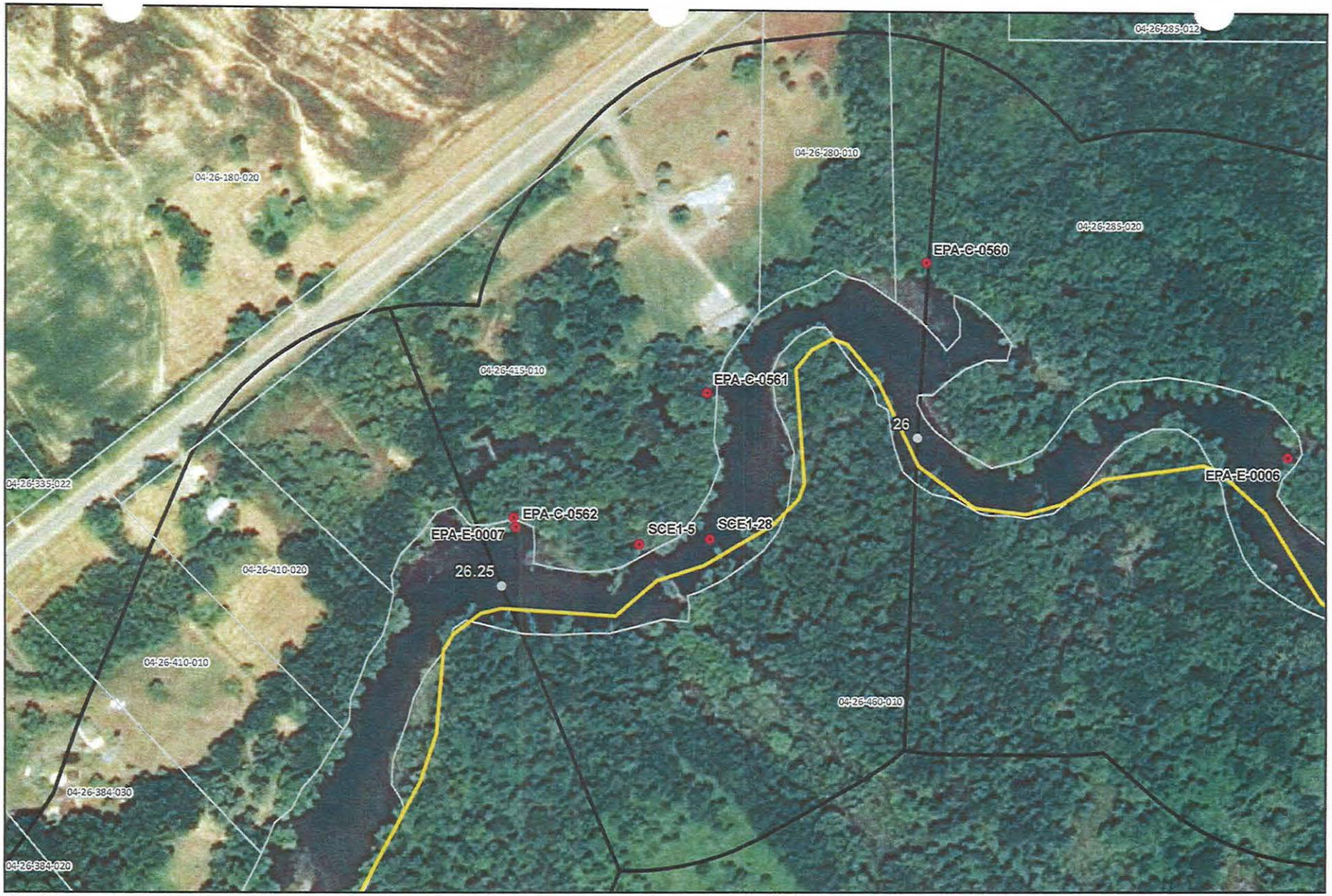
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 26.0-26.25 Left Bank While Looking Downstream										
SCE1-28	Shoreline	Shoreline Assessment	?				Oil on wood in log pile in water. Wash and collect with snare & boom and dispose.	Remove and dispose of vegatation	42.35245	-85.32288





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 26-26.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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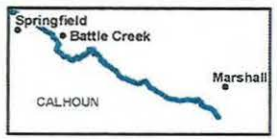
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release ... nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 26.0-26.25 Right Bank While Looking Downstream										
SCE1-5	Shoreline	Shoreline Assessment	•	•		•	Depression behind bank with oily pond. Scrape and absorb up oils.	Scrape oil and collect	42.35242	-85.32338
EPA-C-0562	Shoreline	SCAT T2 09/02/2010	Zone A is in a little inlet just past MP 26.0. There is a slight broken patchy sheen on top of mudflat/floodplain. Minimize entry. No clean up recommendations. Each patch is about 2-5 inches in diameter.					No further action required	42.35250	-85.32427
EPA-E-0007	Shoreline	SCAT T1 8/16/2010	Inland pool with a mousse/surface oil residue film					No further action required	42.35255	-85.32428
EPA-C-0560	Shoreline	SCAT T? 09/01/2010	Zone A is in a little inlet just past mp 26.00. There is a slight broken up/patchy sheen on top of mudflat/floodplain. No clean up recommendations.					No further action required	42.35392	-85.32136
EPA-C-0561	Shoreline	SCAT T? 09/01/2010	Staining on man-made rock wall along shoreline in front of a residence. No clean up recommended.					No further action required	42.35322	-85.32291





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 26-26.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 07-15-10 Time: AM (PM)

Operations Division: E Segment ID: From 26.0 Start MP to End MP 26.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

One Area that was spotted with oil, minimal
vegitation + debri Removal,
- Clean up was completed + No Recomendations.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recomendations

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-15-10 **Time: AM / PM**

Operations Division: E **Segment ID: From** 26.0 **Start MP to End MP** 26.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

[redacted]

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

After viewing the SCAT report the RDB has no further recommendations and the LDB had one area of concern. Clean up required is debris removal.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

I inspected this area and all clean up is complete according to the SCAT recommendations.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 26.0-26.25 Left Bank While Looking Downstream										
SCE1-28	Shoreline Assessment	?				Oil on wood in log pile in water. Wash and collect with snare & boom and dispose.	Remove and dispose of vegatation	42.35245	-85.32288	(Y) N

Printed Team Members Names:

Date:

Comments:

- not flagged in the field, due to stability, no additional rec, SCAT Satisfied

Team 4 9/16/10

Amanda Behrenbluet

Kate Forchio

Ross Del Rosso

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 26.0-26.25 Right Bank While Looking Downstream										
SCE1-5	Shoreline Assessment	•	•		•	Depression behind bank with oily pond. Scrape and absorb up oils.	Scrape oil and collect	42.35242	-85.32338	(Y) N
EPA-C-0562	SCAT T2 09/02/2010	Zone A is in a little inlet just past MP 26.0. There is a slight broken patchy sheen on top of mudflat/floodplain. Minimize entry. No clean up recommendations. Each patch is about 2-5 inches in diameter.					No further action required	42.35250	-85.32427	(Y) / N
EPA-E-0007	SCAT T1 8/16/2010	Inland pool with a mousse/surface oil residue film					No further action required	42.35255	-85.32428	(Y) / N
EPA-C-0560	SCAT T? 09/01/2010	Zone A is in a little inlet just past mp 26.00. There is a slight broken up/patchy sheen on top of mudflat/floodplain. No clean up recommendations.					No further action required	42.35392	-85.32136	(Y) / N
EPA-C-0561	SCAT T? 09/01/2010	Staining on man-made rock wall along shoreline in front of a residence. No clean up recommended.					No further action required	42.35322	-85.32291	(Y) / N

Printed Team Members Names:

Date:

Comments:

- not flagged in the field

not flagged.
not a zone

Team 4 9/16/10
Amanda Bohnenblust
Katie Fairchild
Ross DelRosso

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION **Operations Division:** E **Segment ID: From MP** 26.0 **to MP** 26.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature: Matt Bordson (date): 15-Sep-10 — Enbridge

Signature: Eugene Demers (date): 9-15-2010 — EPA
Eugene Demers, EPA OSC

4. **SCAT Reassessment**

Signature: Amanda Bohnan (date): 9/16/10 — Enbridge

Signature: R. del Rosario (date): 9/16/10 — EPA
ROSS DELROSARIO

Signature: Kathleen Fairchild (date): 9/16/10 — MDNRE

5. **EPA**

Signature: Gary Lipson (date): 9/20/10 — EPA Division Supervisor

Appendix E
Photographs



Photo 0628 – Looking west at left descending bank.



Photo 0629 – Looking north at right descending bank.



Photo 0630 – Looking west at left descending bank.



Photo 0631 – Looking north at right descending bank, near EPA-C-0560.



Photo 0632 – Looking north at right descending bank, near EPA-C-0560.



Photo 0633 – Looking north at right descending bank, near EPA-C-0560.



Photo 0634 – Looking west at right descending bank, near EPA-C-0561.



Photo 0635 – Looking west at right descending bank, near EPA-C-0561.



Photo 0636 – Looking south at left descending bank.

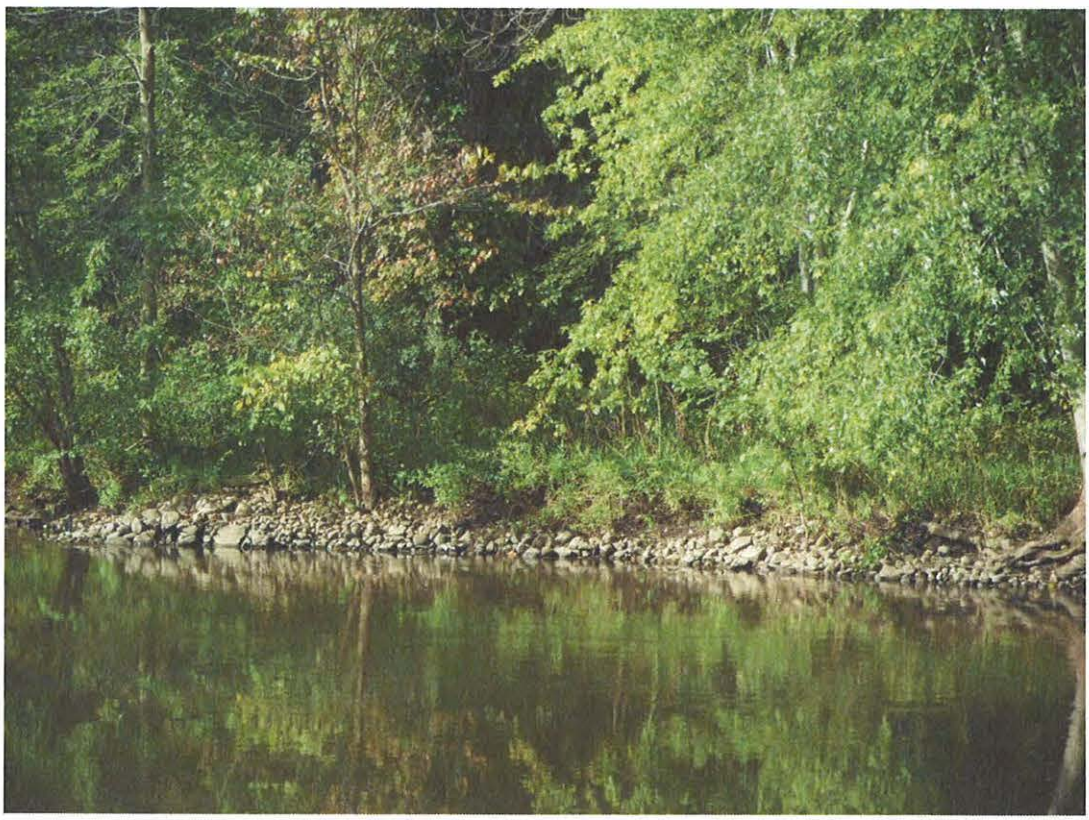


Photo 0637 – Looking west at right descending bank, near EPA-C-0561.



Photo 0638 – Looking south at right descending bank.



Photo 0639 – Looking west at left descending bank, near SCE1-28.



Photo 0640 – Looking northwest at right overbank, near SCE1-5.



Photo 0641 – Looking southeast at left descending bank.



Photo 0642 – Looking north at right descending bank.



Photo 0643 – Looking northeast at right descending bank, near EPA-E-0007.



Photo 0644 – Looking west at right descending bank, near EPA-C-0562.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 26.50 – MP 26.25 to 26.50

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 26.50 had light oiling on the left descending bank and very light oiling on the right descending bank. The overbank contained no areas requiring clean-up and an island was present with no oiling observed. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 26.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial photo)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - No SCAT reassessment of segment conducted; initial SCAT survey indicated no clean-up operations necessary

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**

Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

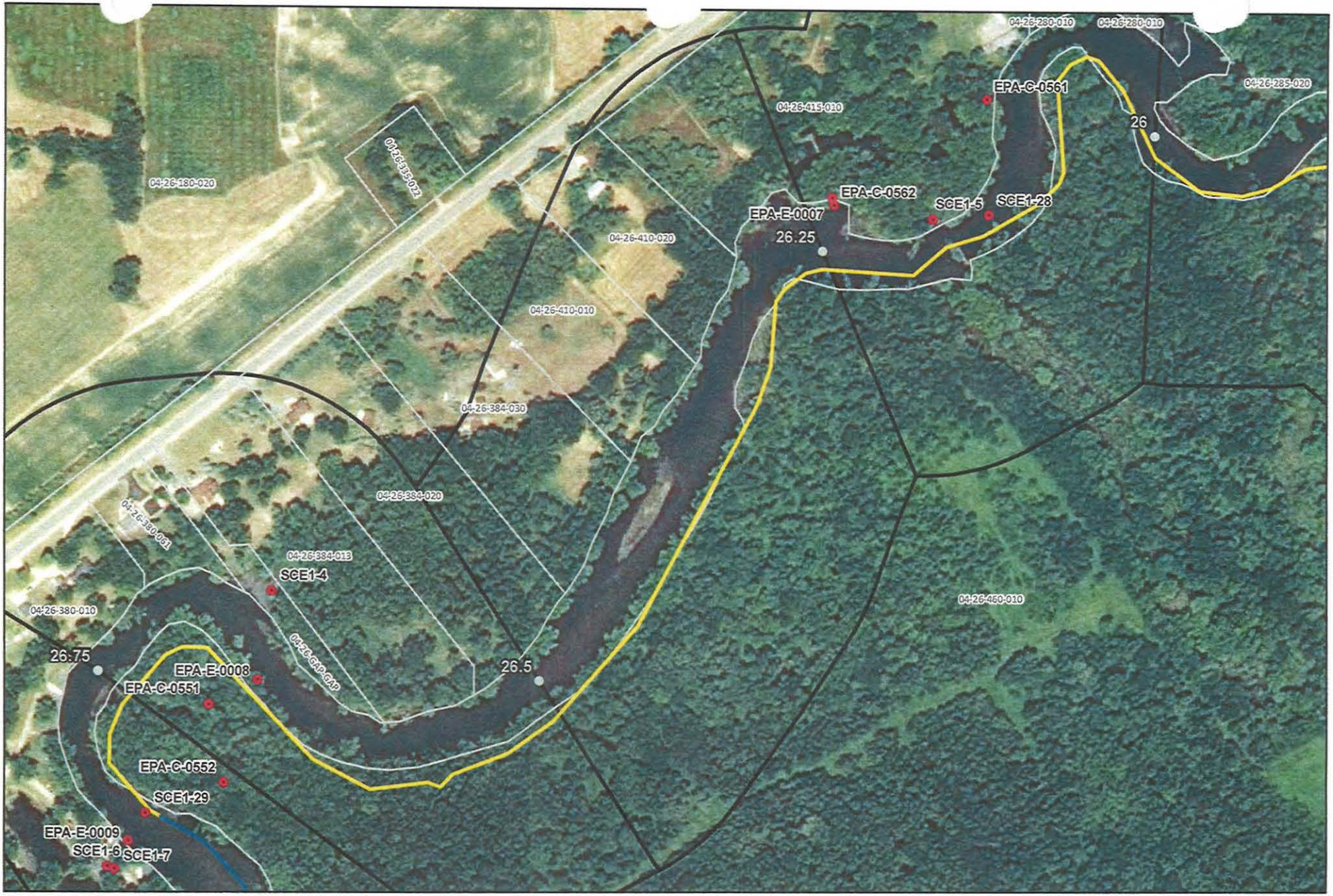
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

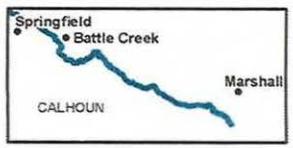
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release in ...it - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 26.25-26.5 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 26.25-26.5 Left Bank While Looking Downstream

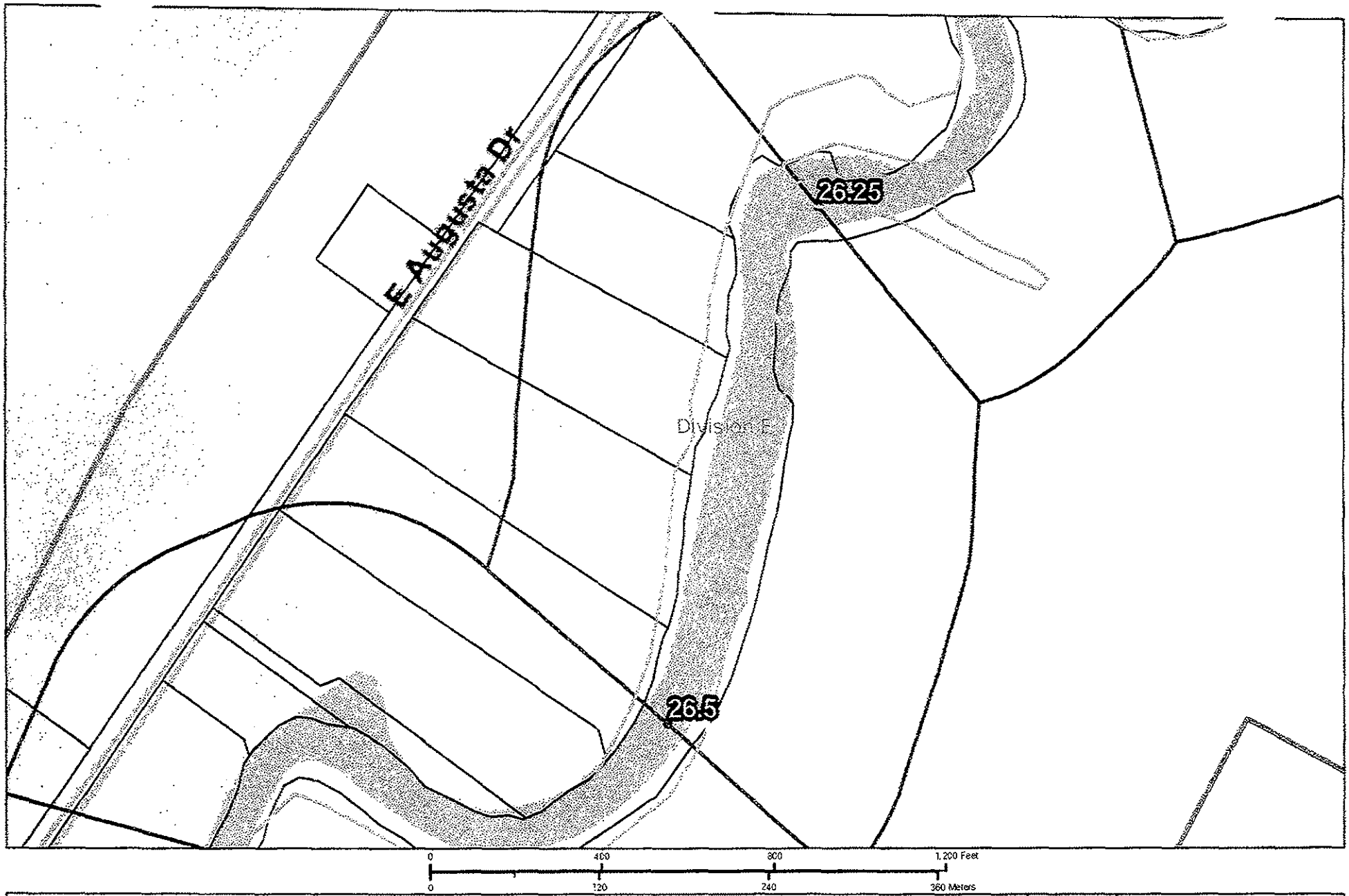
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuarterandeMarkers
Parcels_10200ftBuffer
Shoreline
River_QuarterMiles
Divisions

TEAM 1
9/1/10

NO OIL FOUND

26.25 to 26.5

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business™

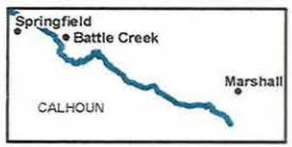
www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 26.25-26.5 Right Bank While Looking Downstream										
No Operational Focus Areas Identified										





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 26.25-26.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 26.25 Start MP to End MP 26.50 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From** 26.25 **Start MP to End MP** 26.50 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 26.35 **to MP** 26.5 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUX	8-30-10 (date)	Enbridge
Signature MJ NALEPINSKI	30 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Karen Van Tiem	9-7-10 (date)	Enbridge Glenn Haven Water 9/7/1 Glenn Haven Water
Signature Kathleen M. Foley	(date) 9-7-10	EPA L. Leonova 9/7/1 LARISA LEONOVA
Signature MATT WESENER	9/8/10 (date)	MDNRE Ernie Sarkipata

5. **EPA**

Signature GARY LIPSON	9/20/10 (date)	EPA Division Supervisor

Appendix E
Photographs



Photo 0597 – Looking west at left descending bank.



Photo 0598 – Looking north at right descending bank.



Photo 0599 – Looking northwest at right descending bank.



Photo 0600 – Looking south at left descending bank.



Photo 0601 – Looking southwest at right descending bank.



Photo 0602 – Looking southwest at island.

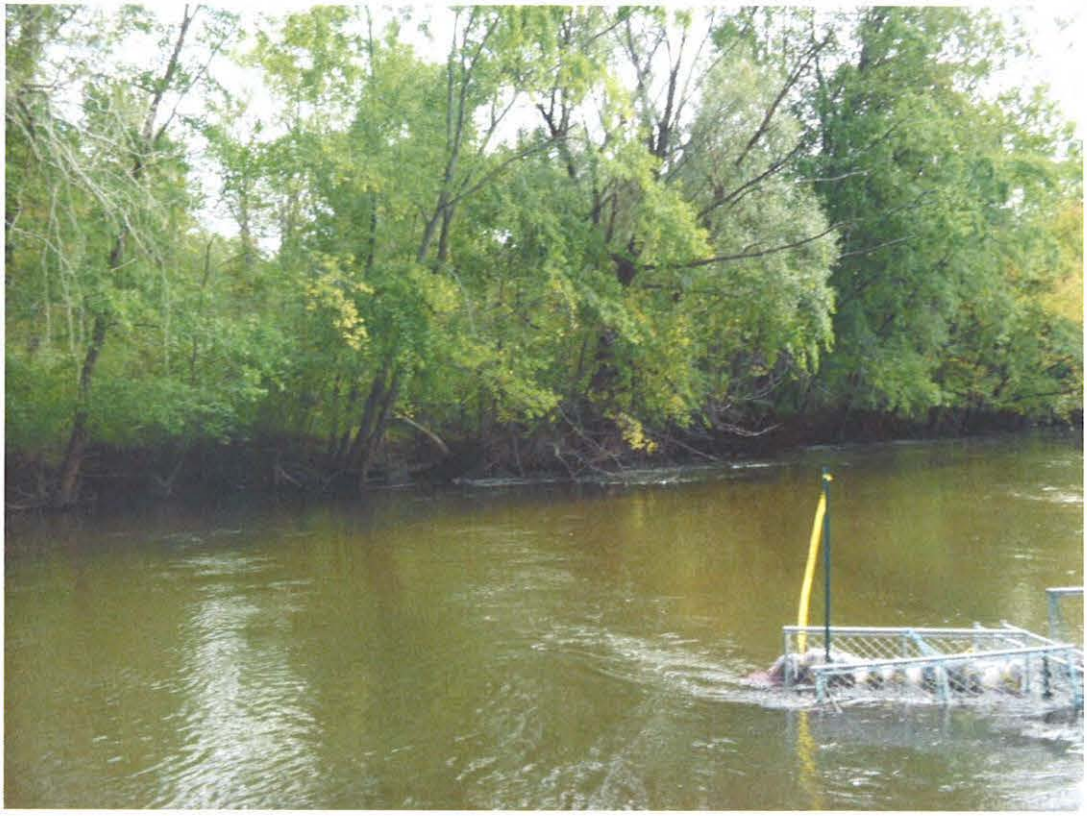


Photo 0603 – Looking south at left descending bank.



Photo 0604 – Looking southwest at island.



Photo 0605 – Looking south at left descending bank.



Photo 0606 – Looking northeast at island.

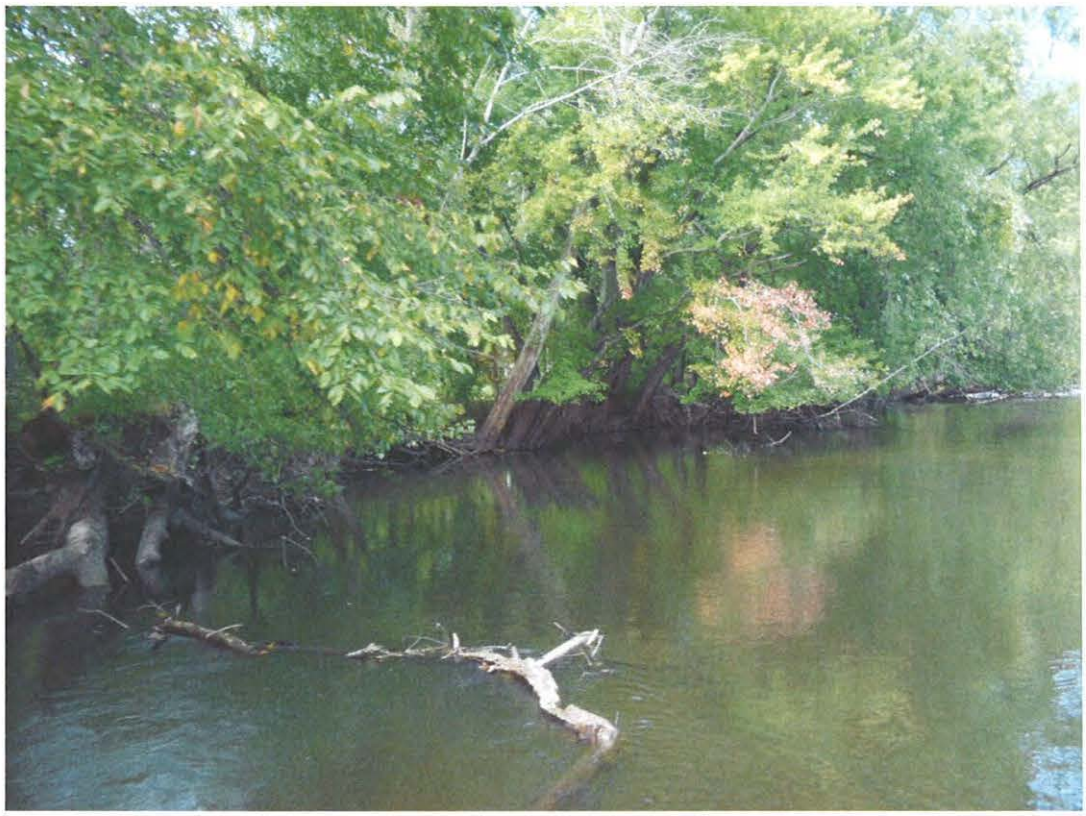


Photo 0607 – Looking north at right descending bank.

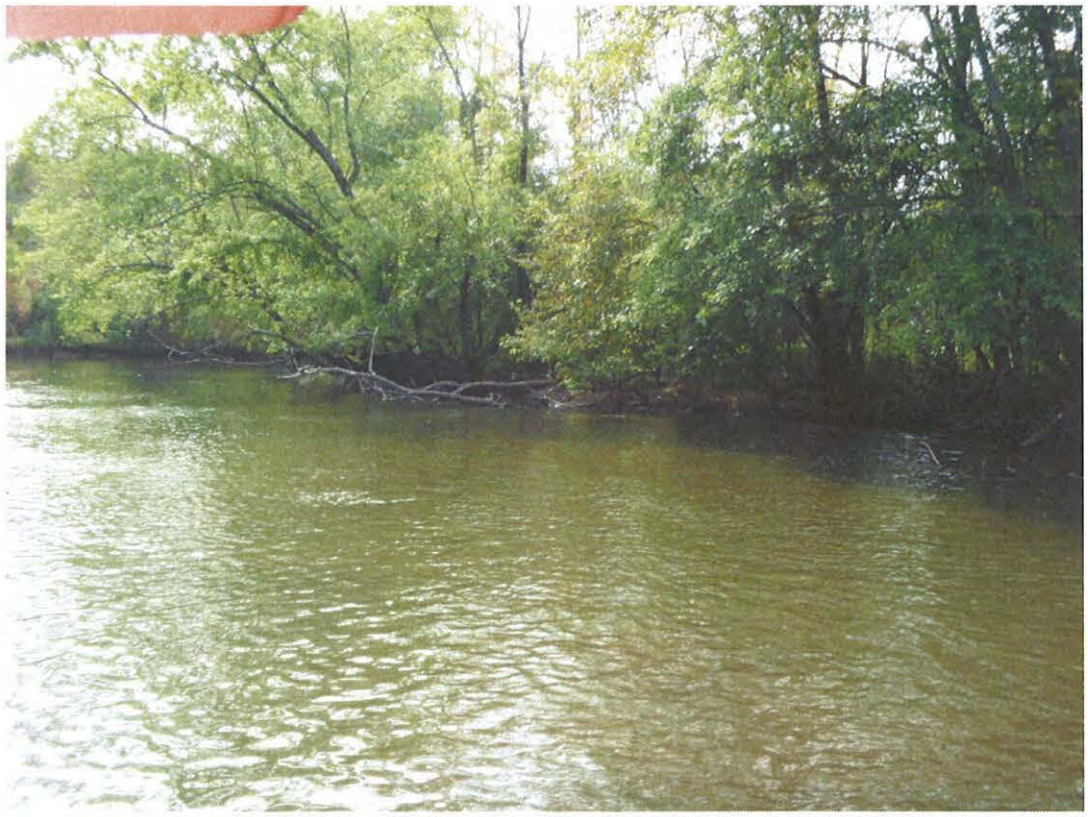


Photo 0608 – Looking southwest at right descending bank.

Field Photo Log – Segment 26.50



Photo 0609 – Looking south at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 26.75 – MP 26.50 to 26.75

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 26.75 had light oiling on the left descending bank. The left descending overbank contained areas of oiled woody debris and sporadic tar deposits. An island was present with no observed oiling. Very light oiling with oil coated sand and vegetation was identified on the right descending bank.

Actions

Free oil was recovered from along the shoreline edge and from behind river flow obstructions as required. The shoreline clean-up activities within Segment 26.75 consisted of the following:

- Removal of top 6" of sand coated with oil;
- Removal of oiled debris;
- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oil stained woody debris.

Segment 26.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial photo and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addresses

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
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PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
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ST	Stain (visible oil, which cannot be scraped off with fingernail)
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Surface Oiling Descriptors - Type

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SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
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Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

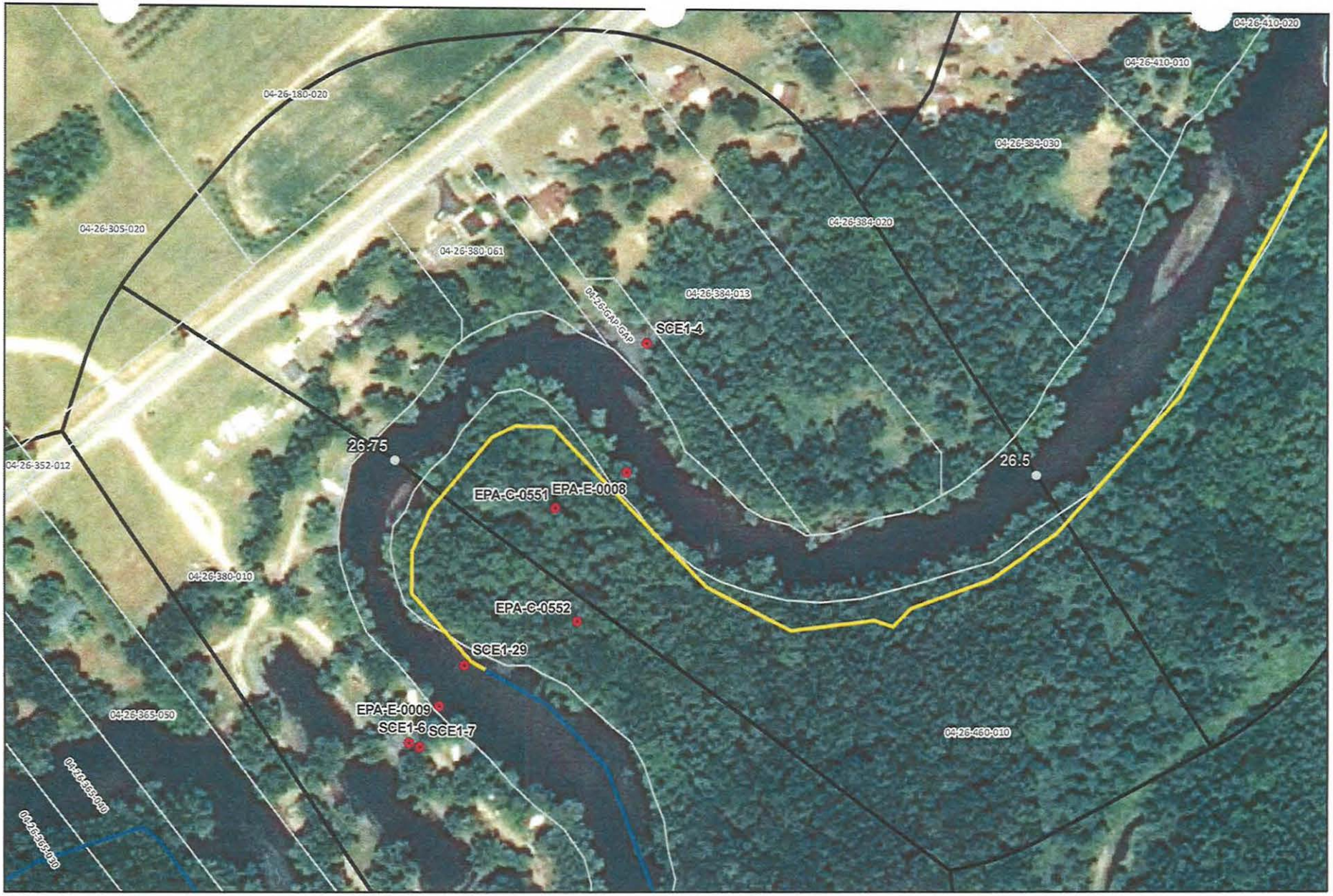
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

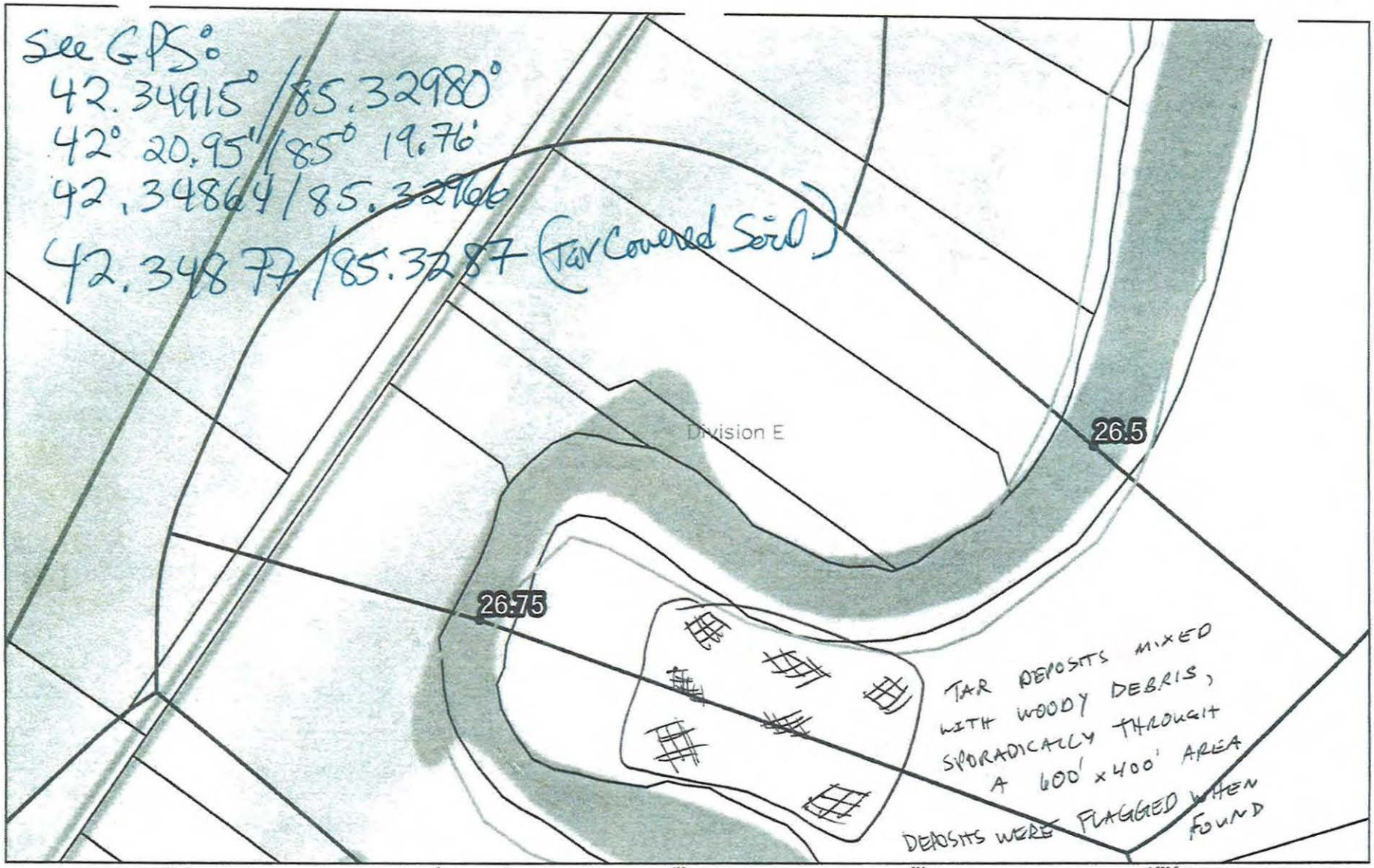
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 26.5-26.75 Left Bank While Looking Downstream										
EPA-C-0551	Overbank	SCAT T1 09/02/2010	(see comments for ID#27.0). ,these two Segments are backto-back on a peninsula-type bend. i.e, patches of tarry debris amongst wood debris rack lines/log jams. Many of these clusters contain tarry patches on the upstream side of the rack lines/debris pi; Zone A occurs in Segment 26.5 and 27.0 ; the zones merge. Debris with tar oil covering occur sporadically throughout the floodplain. Flags have been hung to assist in finding many, but not all, of these patches. Approximately 15-20 woody debris piles were observed and several GPS locations were taken and are listed on the map.					Remove woody debris piles	42.34915	-85.32980


04-26-180-020
04-26-410-020
04-26-410-010
04-26-384-030
04-26-305-020
04-26-384-020
04-26-380-061
04-26-384-013
04-26-GAP-GAP
SCE1-4
26.75
26.5
04-26-352-012
EPA-C-0551
EPA-E-0008
04-26-380-010
EPA-C-0552
SCE1-29
EPA-E-0009
SCE1-6
SCE1-7
04-26-365-050
04-26-460-010
04-26-355-040
04-26-355-030
Springfield
Battle Creek
Marshall
CALHOUN
River Quarter Miles
Operational Focus Area
Pooled Oil
Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
Division E: Mile Marker 26.5-26.75
Left Bank While Looking Downstream
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill
0 75 150
Feet
Source: Aerial Photography: USDA, 2009.
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



QuartermileMarkers
Parcels_1020ftBuffer
Shoreline
River_QuarterMiles
Divisions

TEAM 1
9/7/10

Foley

26.5 to 26.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
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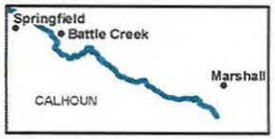
Enbridge Pipeline Release In[illegible]nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 26.5-26.75 Right Bank While Looking Downstream										
SCE1-4	Shoreline	Shoreline Assessment	•		•		Coated sand bank with oil. Scrape top 6ft; pads. Vegetation in alcove has stained stalks. Micor filmed oil; Recommend cutting stalks out.	Coated sand bank with oil. Scrape top 6ft; pads. Vegetation in alcove has stained stalks. Micor filmed oil; Recommend cutting stalks out.	42.3499	-85.32925





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 26.5-26.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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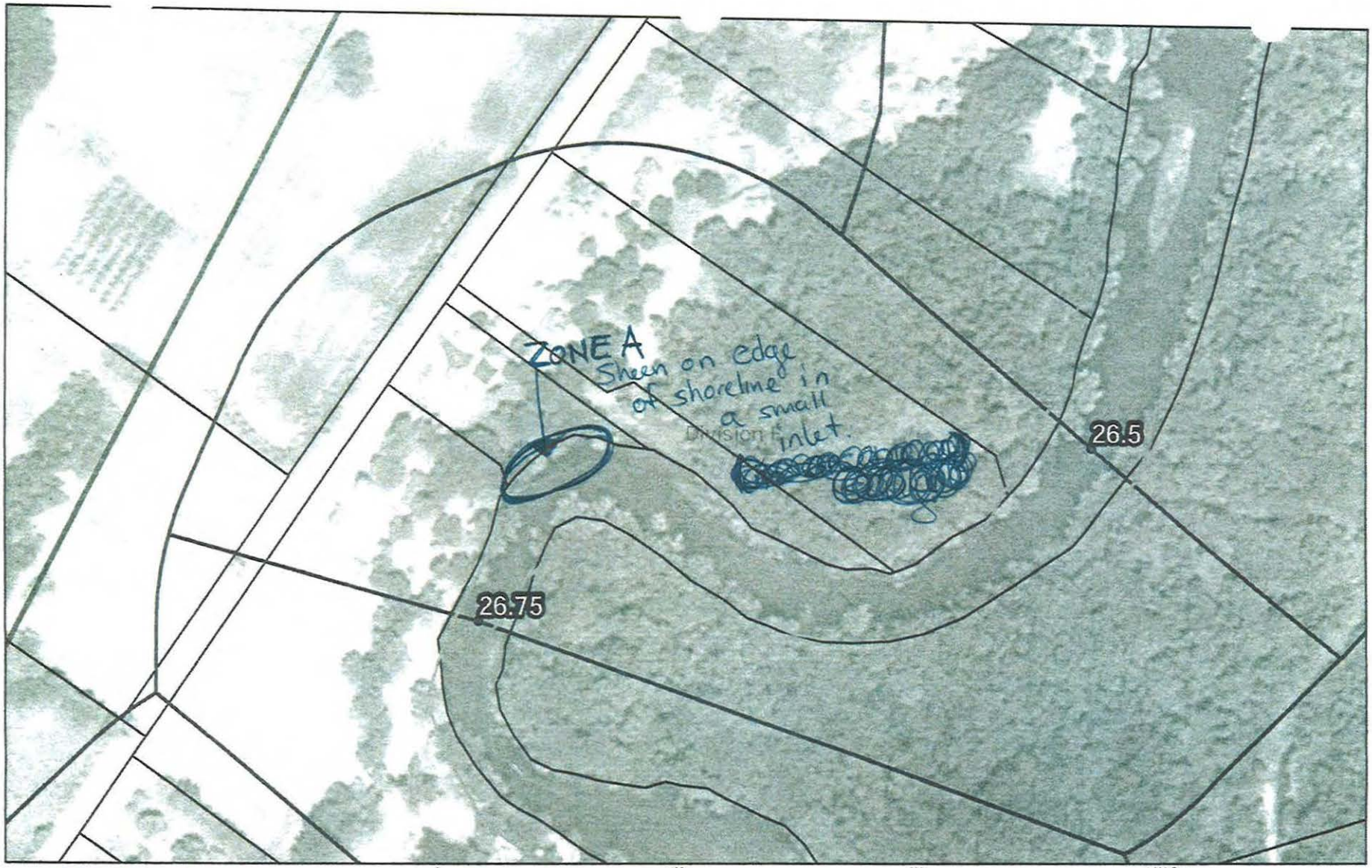
Coordinate System: NAD 1983 State Plane Michigan South Feet



TEAM #2

9-01-10

QuarterMileMarkers
Parcels_1020ftBuffer
Shoreline
River_QuarterMiles
Divisions

26.5 to 26.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 46

ENTRIX
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Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 07-15-10 **Time: AM / PM**

Operations Division: C **Segment ID: From** [redacted] **Start MP** 26.5 **to End MP** [redacted] 26.75 **Segment Length: 0.25 mile**

Bank: LDB (RDB) ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): ABC STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA** * Submerged oil

No Recommendations.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-15-10 **Time: AM /(PM)**

Operations Division: E **Segment ID: From** 26.5 **Start MP to End MP** 26.75 **Segment Length: 0.25 mile**

Bank: (LDB) / (RDB) ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

[redacted]

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed the 2 areas from the [redacted] SCAT report and clean up required is flushing, vegetation & debris removal and patchy tar

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected the area and all clean up is complete according to the SCAT Recommendations

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 26.5-26.75 Left Bank While Looking Downstream										
EPA-C-0551	SCAT T1 09/02/2010	(see coments for ID#27.0). these two Segments are backto-back on a peninsula-type bend. I.e, patches of tarry debris amongst wood debris rack lines/log jams. Many of these clusters contain tarry patches on the upstream side of the rack lines/debris pi; Zone A occurs in Segment 26.5 and 27.0 ; the zones merge. Debris with tar oil covering occur sporadically throughout the floodplain. Flags have been hung to assist in finding many, but not all, of these patches. Approximately 15-20 woody debris piles were observed and several GPS locations were taken and are listed on the map.					Remove woody debris piles	42.34915	-85.32980	Y N
EPA-E-0008	SCAT T1 08/16/10	No Comment					Refer to Kalamazoo Enbridge Oil Cleanup Methods	42.34900	-85.32900	Y N

Printed Team Members Names:

Date:

Comments:

not flagged in the full walked entire peninsula - no signs of also debris. Clear for both 26.75 & 27.

not flagged, walked shaded no issues observed

Team 4 9/16/10
Amanda Bohnenblust
Kate Yarchild
Ross Del Rosso

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS										
ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 26.5-26.75 Right Bank While Looking Downstream										
SCE1-4	Shoreline Assessment	•		•		Coated sand bank with oil. Scrape top 6ft; pads. Vegetation in alcove has stained stalks. Micor filmed oil; Recommend cutting stalks out.		42.3499	-85.32925	Y N

Printed Team Members Names:

Date:

Comments:

Team 4 9/16/10

Amanda Bohnenblues

Katie Forchel

Ross Del Rosario

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION **Operations Division:** B **Segment ID: From MP** 26.5 **to MP** 26.75 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature Matt Boroson (date) 15-Sep-10 Enbridge

Signature Eugene Dennis EPA, OSC (date) 9-15-2010 EPA

4. **SCAT Reassessment**

Signature Amanda Bohnenblust (date) 9/16/10 Enbridge

Signature ROSS DEL ROSARIO (date) 9/16/10 EPA

Signature Kathleen Fairchild (date) 9/16/10 MDNRE

5. **EPA**

Signature GARY LIPSON (date) 9/20/10 EPA Division Supervisor

Appendix E
Photographs



Photo 0645 – Looking west at right descending bank.



Photo 0646 – Looking south at left descending bank.



Photo 0647 – Looking south at left descending bank.



Photo 0648 – Looking west at right descending bank.



Photo 0649 – Looking west at right descending bank



Photo 0650 – Looking south at left descending bank.



Photo 0651 – Looking northeast at right descending bank, near SCE1-4..



Photo 0652 – Looking north at right descending bank, near SCE1-4.



Photo 0653 – Looking northwest at right descending bank, near SCE1-4.



Photo 0654 – Looking west at right descending bank.



Photo 0655 – Looking south at left descending bank.



Photo 0656 – Looking west at right descending bank.



Photo 0657 – Looking souheast at left descending bank



Photo 0658 – Looking southwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 27.00 – MP 26.75 to 27.00

Enbridge Energy

September 18, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 27.00 had light to no oiling on the left descending bank, with some oiled overhanging vegetation. The left descending side's overbank contained oiled woody debris requiring clean-up in Zone A. No islands were present within the river segement. Very light to no oiling was present on the right descending bank, with some stained rocks observed.

Actions

The shoreline clean-up activities within Segment 27.00 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs;
- Removal of oiled debris;
- High pressure flushing of man-made structures and/or rocks.

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled woody vegetation on left overbank near EPA-C-0552 in Zone A;
- Oiled debris on left overbank near EPA-C-0552 in Zone A.

Segment 27.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

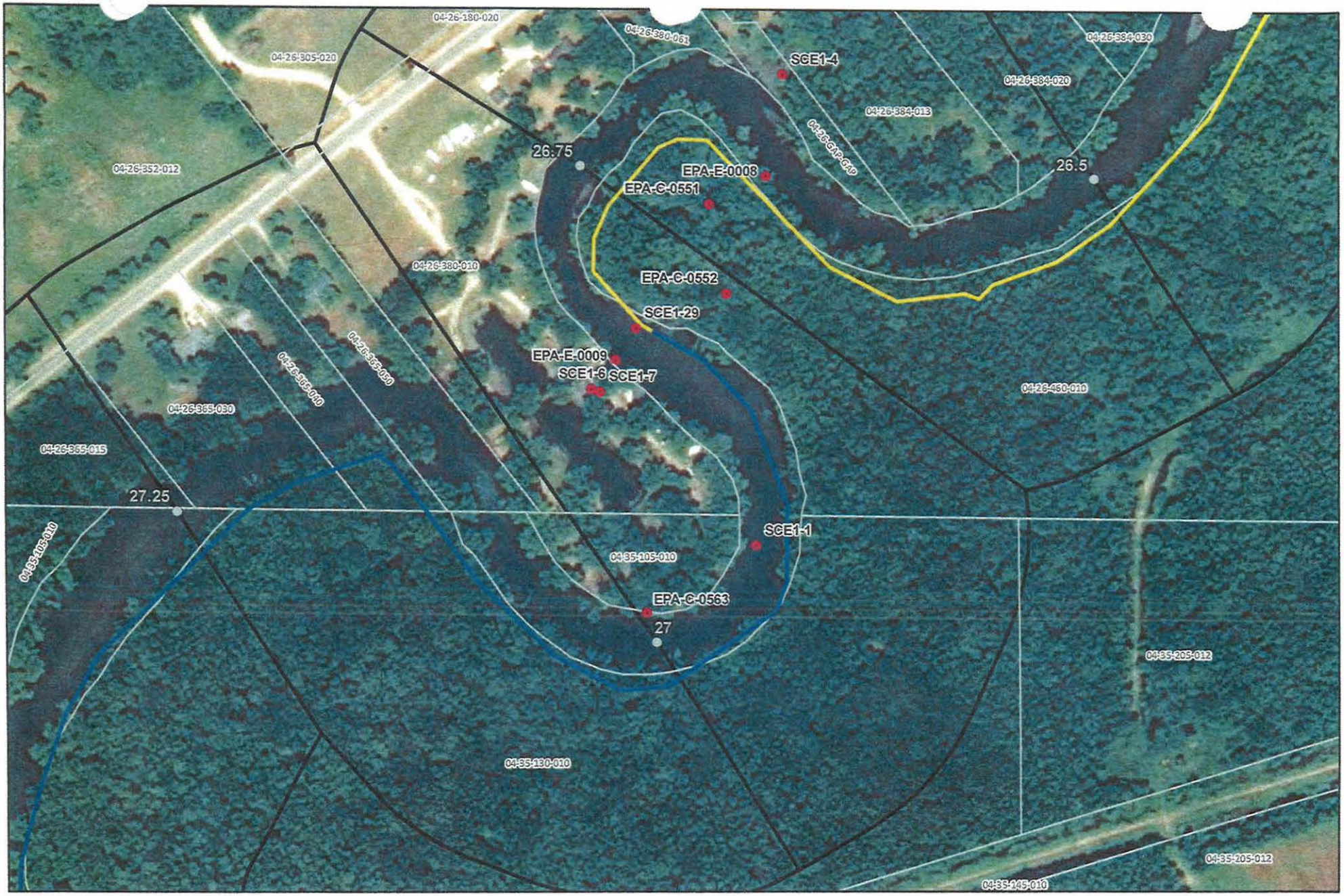
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

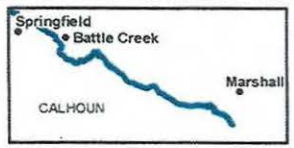
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release I[illegible] - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 26.75-27.0 Left Bank While Looking Downstream										
EPA-C-0552	Overbank	SCAT T1 09/02/2010	Zone A occurs in Segments 26.5 and 27.0; the zones merge. Woody debris dropped by flood water has tar oil covering occur sporadically throughout the floodplain. Flags have been hung to assist in finding many, but not all, of these debris piles. Approxiamtely 15-20 woody debris piles were observed. These are typically located on the upstream edge of the rack line/log jams. Several GPS locations were taken and are listed on the map.					Remove oily and/or tarry patches of woody debris. these are typically made up of almost sawdust and find wood-chip material embedded w/i the log jam/rack line created during the recent high flood stage. Flags have been hung to help guide the crew to SO	42.34864	-85.32966
EPA-E-0009	Shoreline	SCAT T1 8/16/2010	Coated/stained overhanging vegetation						42.34825	-85.33050





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 26.75-27
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Team 1 - Foley
9/1/10

26.75 to 27

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

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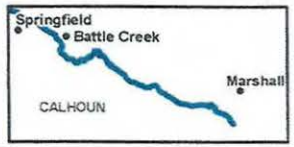
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 26.75-27.0 Right Bank While Looking Downstream										
SCE1-1	Shoreline	Shoreline Assessment					Drops of oil on sandy beach; recommend natural attenuation.	recommend natural attenuation.	42.34720	-85.32942
SCE1-7	Shoreline	Shoreline Assessment					Start point of assessment. No recommendations provided.	No recommendations provided.	42.34807	-85.33062
EPA-C-0563	Shoreline	SCAT T2 09/02/2010	Oiled rocks along shoreline in front of residence and camper park. We recommend washing the rocks since it is in front of a recreational park					Recommend washing the rocks since it is in front of a recreational park	42.34681	-85.33025





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 26.75-27
Right Bank While Looking Downstream

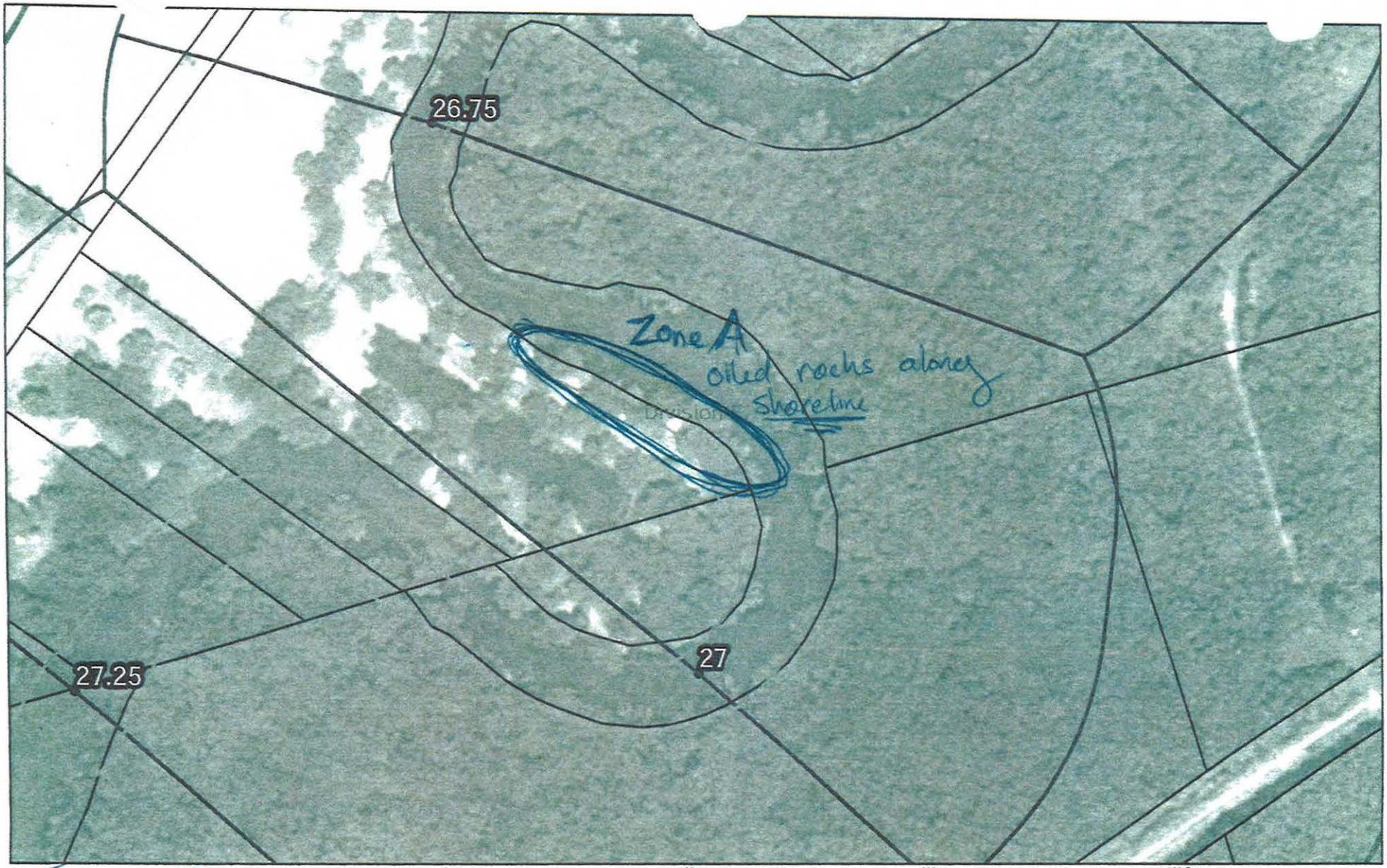
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



0 400 800 1,200 Feet

0 120 240 360 Meters

TEAM #2

9-01-2010

- QuarterMileMarkers
- Parcels_10200ftButter
- Shoreline
- River_QuarterMiles
- Division

26.75 to 27

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET = 48

ENTRIX

Down to Earth, Down to Business

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: Sept 12 2010 **Time: AM / PM**

Operations Division: E **Segment ID: From** 26.75 **Start MP to End MP** 27.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/ 57°

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor): STEVE Turner

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Clean up Completed

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Clean up Completed

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-12-10 **Time:** AM / ~~PM~~

Operations Division: D **Segment ID: From** 26.75 **Start MP to End MP** 27.0 **Segment Length:** 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

After reviewing the SCAT report, there is 3 areas of concern. Clean up required is veg + debris removed, overhanging veg. and oily rocks.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 3 areas of concern according to the SCAT report and all clean up is complete according to the SCAT report.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 26.75-27.0 Left Bank White Looking Downstream										
EPA-C-0552	SCAT T1 09/02/2010	Zone A occurs in Segments 26.5 and 27.0; the zones merge. Woody debris dropped by flood water has tar oil covering occur sporadically throughout the floodplain. Flags have been hung to assist in finding many, but not all, of these debris piles. Approxiamtely 15-20 woody debris piles were observed. These are typically located on the upstream edge of the rack line/log jams. Several GPS locations were taken and are listed on the map.					Remove oily and/or tarry patches of woody debris. these are typically made up of almost sawdust and find wood-chip material embedded w/i the log jam/rack line created during the recent high flood stage. Flags have been hung to help guide the crew to SO	42.34864	-85.32966	(Y) / N
EPA-E-0009	SCAT T1 8/16/2010	Coated/stained overhanging vegetation						42.34825	-85.33050	(Y) / N
SCE1-29		Reference Point Only						42.34800	-85.33000	NA

Printed Team Members Names: Mike Van Loan, Chris Clanfott, Howard Pham

Date: 9/14/10

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 26.75-27.0 Right Bank While Looking Downstream										
SCE1-1	Shoreline Assessment					Drops of oil on sandy beach; recommend natural attenuation.	recommend natural attenuation.	42.34720	-85.32942	(Y) / N
SCE1-7	Shoreline Assessment					Start point of assessment. No recommendations provided.	No recommendations provided.	42.34807	-85.33062	(Y) / N
EPA-C-0563	SCAT T2 09/02/2010	Oiled rocks along shoreline in front of residence and camper park. We recommend washing the rocks since it is in front of a recreational park.					Recommend washing the rocks since it is in front of a recreational park	42.34681	-85.33025	(Y) / N
SCE1-6		Reference Point Only						42.34800	-85.33100	NA

Printed Team Members Names: Mike Van Loon, Chris Claypitt, Howard Pham

Date: 9/14/10

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 26.75 to MP 27.00 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley 13-Sept-2010 (date) Enbridge

Signature Eduardo Rovira 9/13/10 (date) EPA
Eduardo Rovira

4. **SCAT Reassessment**

Signature 9/14/10 (date) Enbridge

Signature 9/14/10 (date) EPA

Signature 9/14/10 (date) MDNRE

5. **EPA**

Signature 9/18/10 (date) EPA Division Supervisor
GARY LIPSON

Appendix E
Photographs

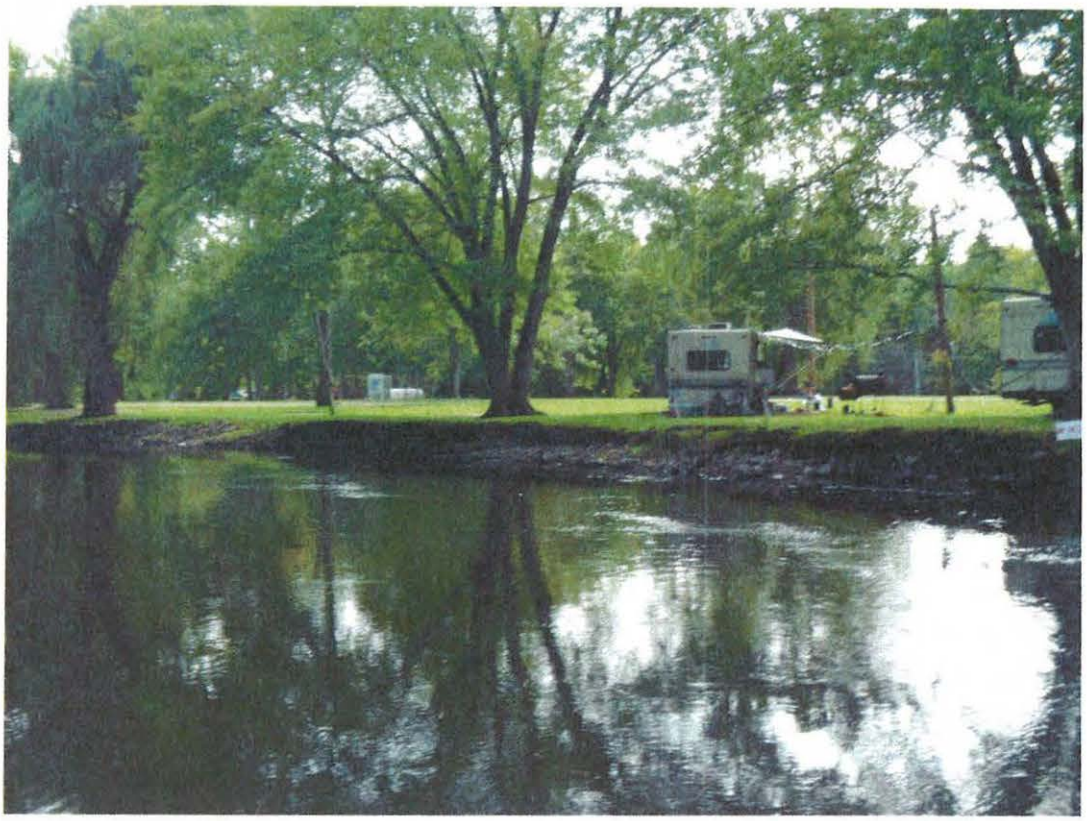


Photo 0610 – Looking west at right descending bank.



Photo 0611 – Looking southeast at left descending bank.

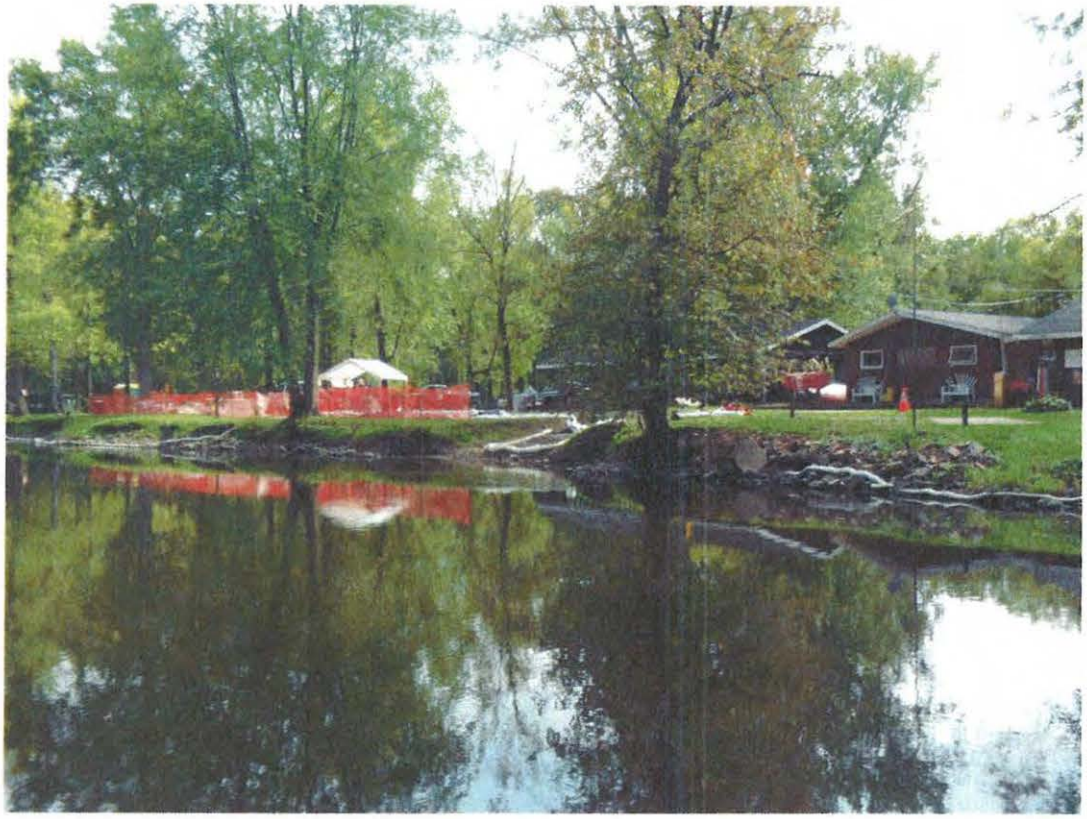


Photo 0612 – Looking south at right descending bank.



Photo 0613 – Looking southeast at left descending bank, near SCE1-29.



Photo 0614 – Looking northwest at left descending bank, near EPA-E-0009.



Photo 0615 – Looking southeast at left descending bank, near EPA-E-0009.



Photo 0616 – Looking southwest at left overbank, near EPA-C-0552.



Photo 0617 – Looking south at left overbank, near EPA-C-0552.



Photo 0618 – Looking south at left overbank, near EPA-C-0552.



Photo 0619 – Looking southwest at left overbank, near EPA-C-0552.

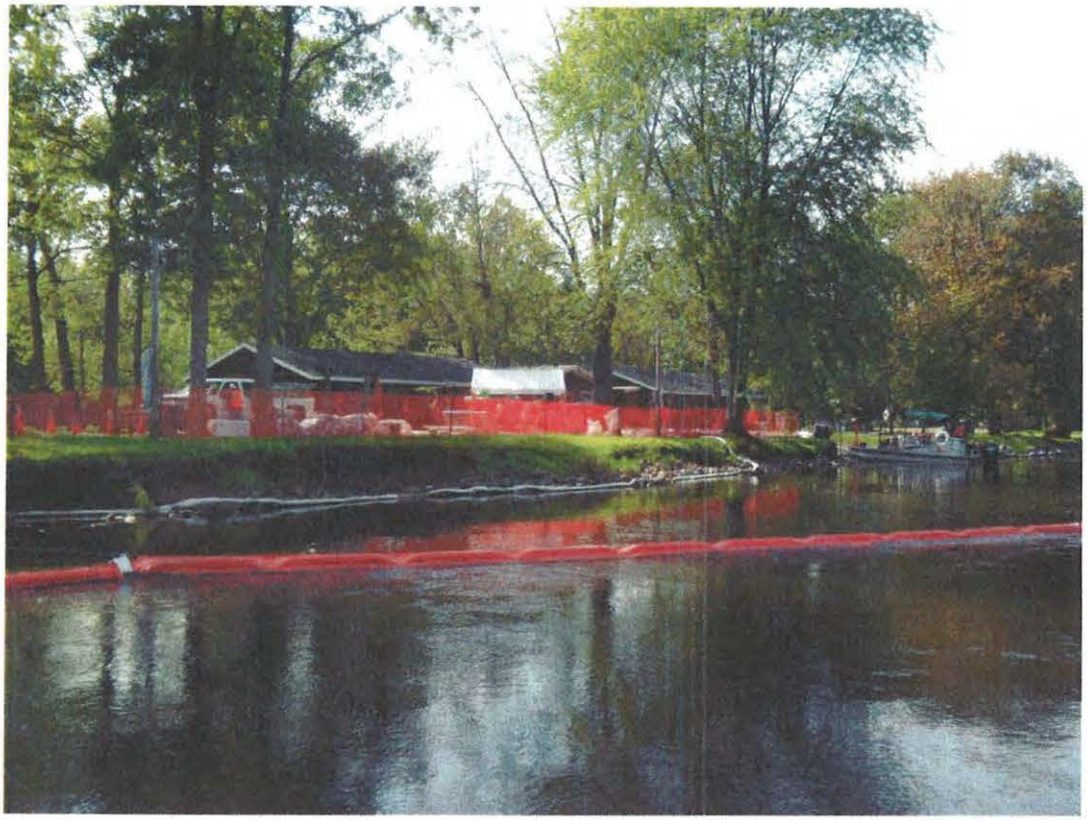


Photo 0620 – Looking northwest at right descending bank, near EPA-C-0563, SCE1-7 and SCE1-6.



Photo 0621 – Looking southeast at left descending bank.

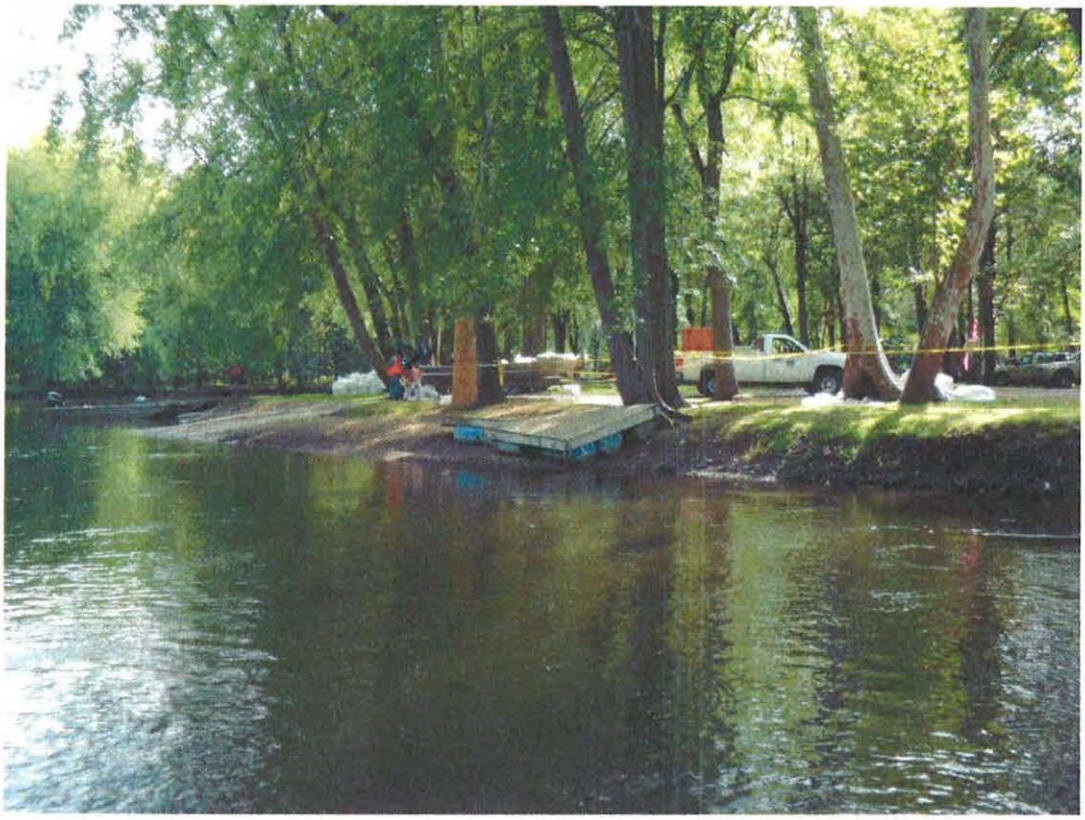


Photo 0622 – Looking southwest at right descending bank.



Photo 0623 – Looking south at left descending bank.



Photo 0624 – Looking south at left descending bank.



Photo 0625 – Looking west at right descending bank.



Photo 0626 – Looking northwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 27.25 – MP 27.00 to 27.25

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 27.25 had no oiling on the left or right descending bank except for patchy oiled leaves. The overbank contained no areas requiring clean-up. A small island on the inside of the meander bend, was present and unoiled. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, the following operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

- Removal of oiled debris

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 27.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

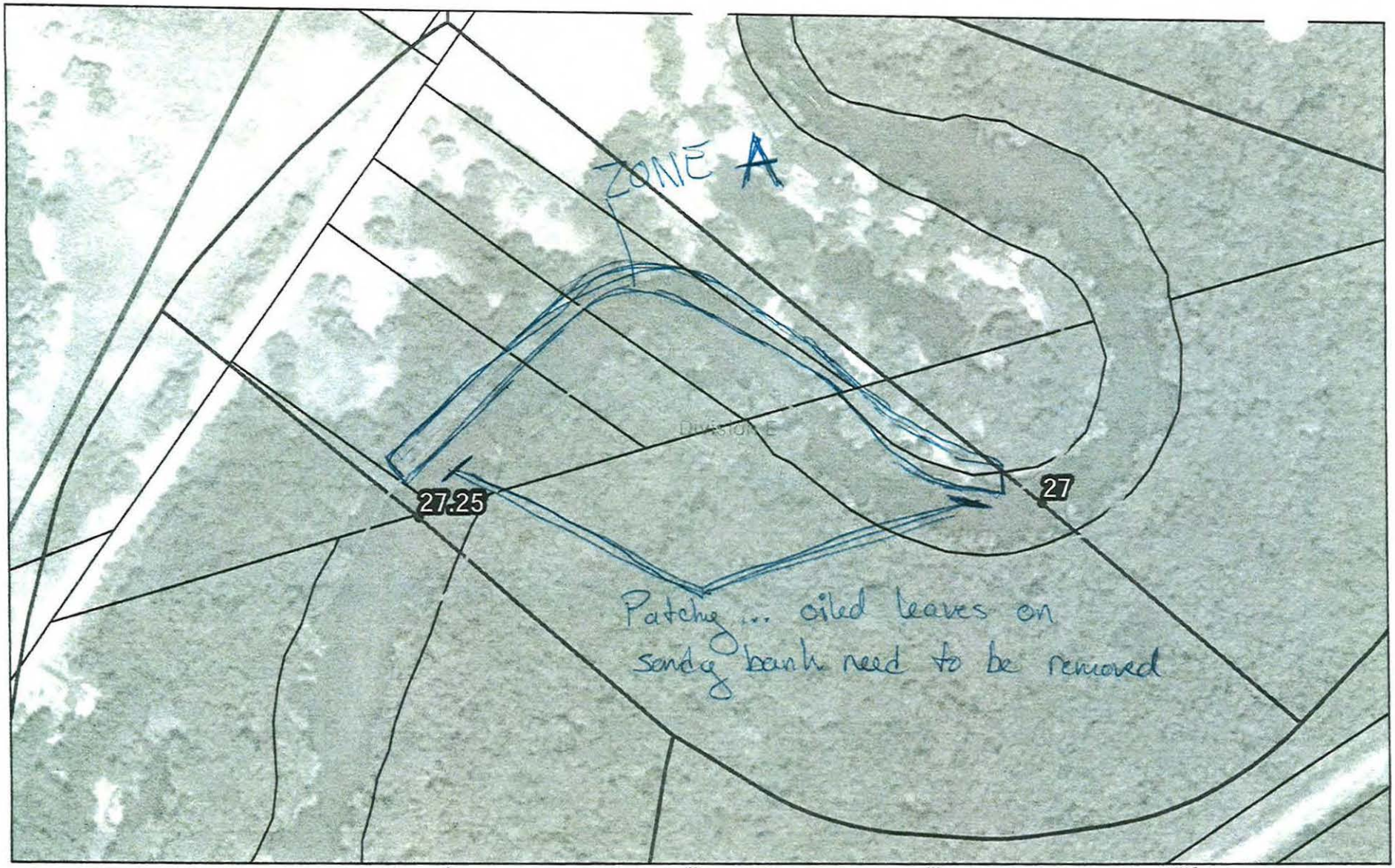
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In.. .nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 27.0-27.25 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			


26.75
27.25
27
EPA-C-0551
EPA-E-0008
EPA-C-0552
SCE1-29
EPA-E-0009
SCE1-6
SCE1-7
SCE1-1
EPA-C-0563
04-26-305-020
04-26-384-020
04-26-384-013
04-26-460-010
04-26-380-010
04-26-365-030
04-26-365-040
04-26-365-015
04-26-352-012
04-35-105-010
04-35-130-010
04-34-245-011
04-35-143-010
Springfield
Battle Creek
Marshall
CALHOUN
River Quarter Miles
Operational Focus Area
Pooled Oil
Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
Division E: Mile Marker 27-27.25
Left Bank While Looking Downstream
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill
0 75 150
Feet
Source: Aerial Photography: USDA, 2009.
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet



TEAM #2
9-01-10

0 400 800 1,200 Feet
0 120 240 360 Meters

QuartermileMarkers
Parcels_10200ftBuffer
Shoreline
River_QuarterMiles

27 to 27.25

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business.
www.entrix.com

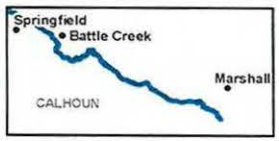
Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Enbridge Pipeline Release In... nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 27.0-27.25 Right Bank While Looking Downstream										
Entire Right Bank							Zone starts just after MP 27.00 sign and goes until MP 27.25. Oily leaves on sandy beach (in front of camper park) should be removed manually by rakes. Monitor and maintain this area.	Remove oiled leaves on shoreline in front of camp ground		





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 27-27.25
Right Bank While Looking Downstream

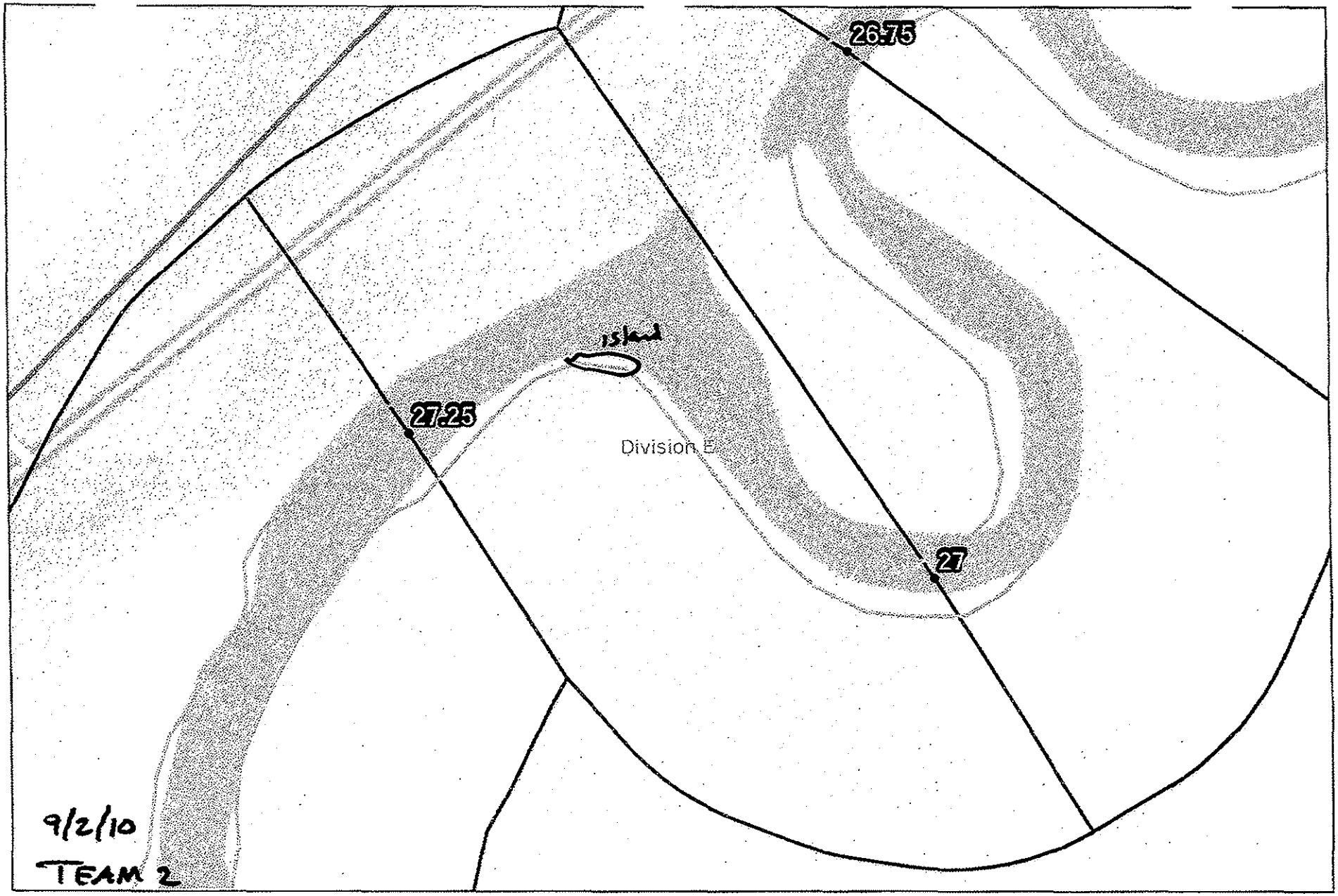
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

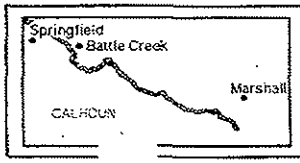
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

35.5 to 35.75

Enbridge Pi... e Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michi... n Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 10-Sept-10 Time: AM / PM

Operations Division: E Segment ID: From 27.0 Start MP to End MP 27.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 24°C

Field Inspection Team

Enbridge Inspector: Doug Dean. 10-Sept-10.

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

→ Identified SCAT point marked green.

→ "Oiled" leaves were wringed out and no sheen was produced.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-10-10 **Time: AM / PM**

Operations Division: 1D **Segment ID: From** 27.0 **Start MP to End MP** 27.25 **Segment Length: 0.25 mile**

Bank: ~~LDB / RDB~~ ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed the RDB according to the SCAT report
Clean up required is Oily leaves on Sand Beach.
LDB is complete

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected the RDB and it is complete according to the SCAT report.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 27.0-27.25 Left Bank While Looking Downstream										
						No Operational Focus Areas Identified				(Y) / N
										Y / N
										Y / N
										Y / N
										Y / N

Printed Team Members Names: ERNIE SARRIPATO

Date: 9/12/10

ROSS DELROSARIO, USEPA

Mike Van Loan, Enbridge

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 27.0-27.25 Right Bank While Looking Downstream										
Entire Right Bank			Zone starts just after MP 27.00 sign and goes until MP 27.25. Oily leaves on sandy beach (in front of camper park) should be removed manually by rakes. Monitor and maintain this area.				Remove oiled leaves on shoreline in front of camp ground			(Y) N

Printed Team Members Names: ERNIE SARKIPATO

Date: 9/12/10

Comments: ROSS DEL ROSARIO, USEPA

Mike Van Loan, Enbridge

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 27.00 to MP 27.25 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costello 11-Sept-2010 (date) Enbridge

Signature Eduardo Rovira 9/11/10 (date) EPA

4. **SCAT Reassessment**

Signature Tim Conn 9/12/10 (date) Enbridge

Signature Ross DelRosario 9/12/10 (date) EPA

Signature Ernest Sarcipato 9/12/10 (date) MDNRE

5. **EPA**

Signature Gary Lipson 9/17/10 (date) EPA Division Supervisor

Appendix E
Photographs



Photo 0443 – Looking west at left descending bank.



Photo 0444 – Looking northwest at right descending bank.



Photo 0445 – Looking west at left descending bank.



Photo 0446 – Looking northwest at right descending bank.



Photo 0447 – Looking northwest at right descending bank.



Photo 0448 – Looking southwest at left descending bank.



Photo 0449 – Looking west at right descending bank.



Photo 0450 – Looking east at island.



Photo 0451 – Looking west at right descending bank.



Photo 0452 – Looking southwest at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 27.50 – MP 27.25 to 27.50

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 27.50 had no oiling on the left descending bank and very light to no oiling on the right descending bank. The overbank contained no areas requiring clean-up and two islands were found in Segment 27.50 with no oiling observed. Mudflat oil sheen was observed in the water when disturbed and was recommended for assessment by submerged oil team. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 27.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

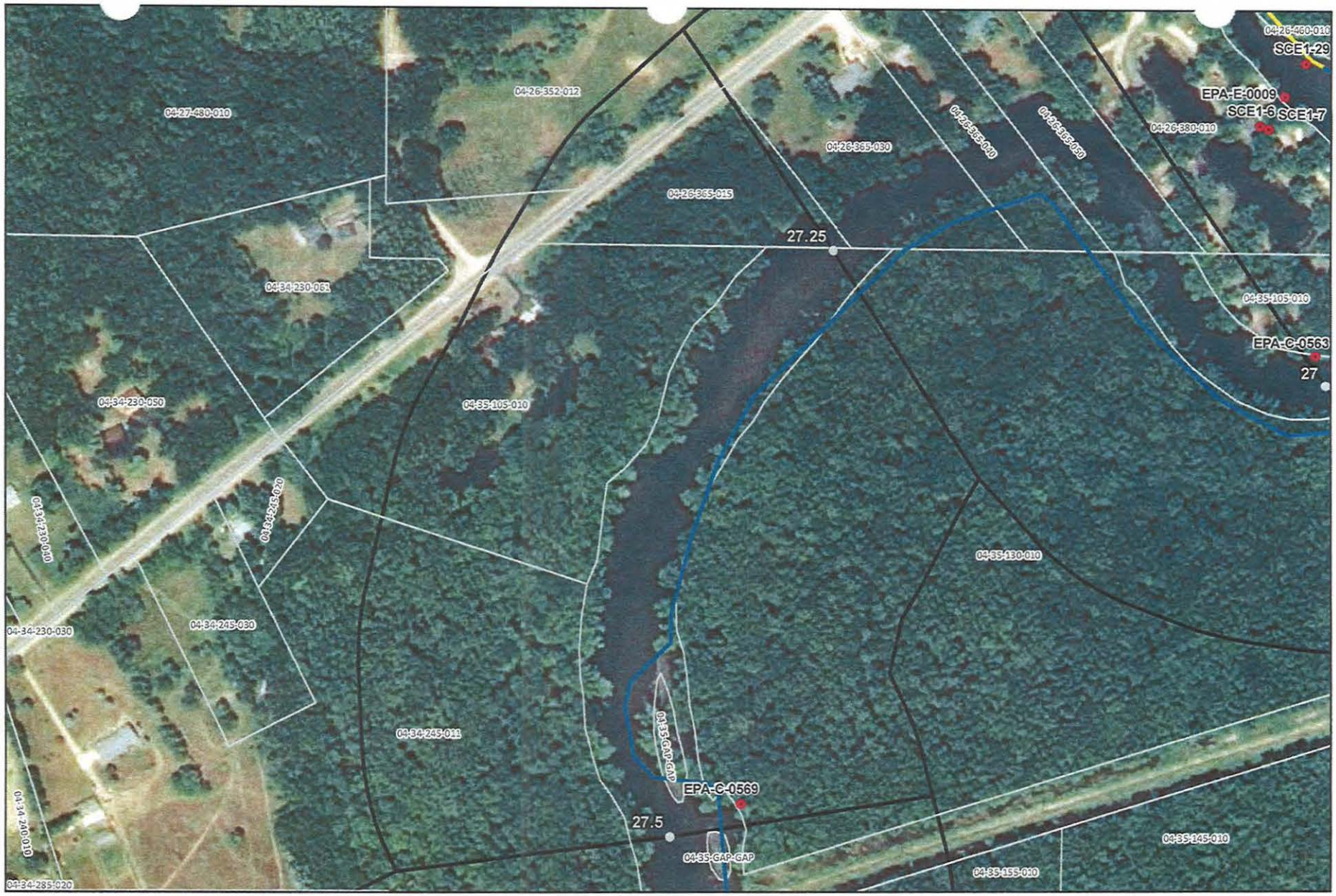
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

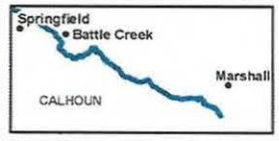
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 27.25-27.5 Left Bank While Looking Downstream										
EPA-C-0569	Shoreline	SCAT T2 09/02/2010	Zone A is located between two islands just before MP 12.50. Mud Flat produces sheen in water when disturbed. We recommened that further assessment by done by the submerdged oil team. ; There were two islands found in segment 27.50. There was no oil observed on these islands.					Recommend that further assessment by done by the submerged oil team.	42.34430	-85.33450





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 27.25-27.5
Left Bank While Looking Downstream

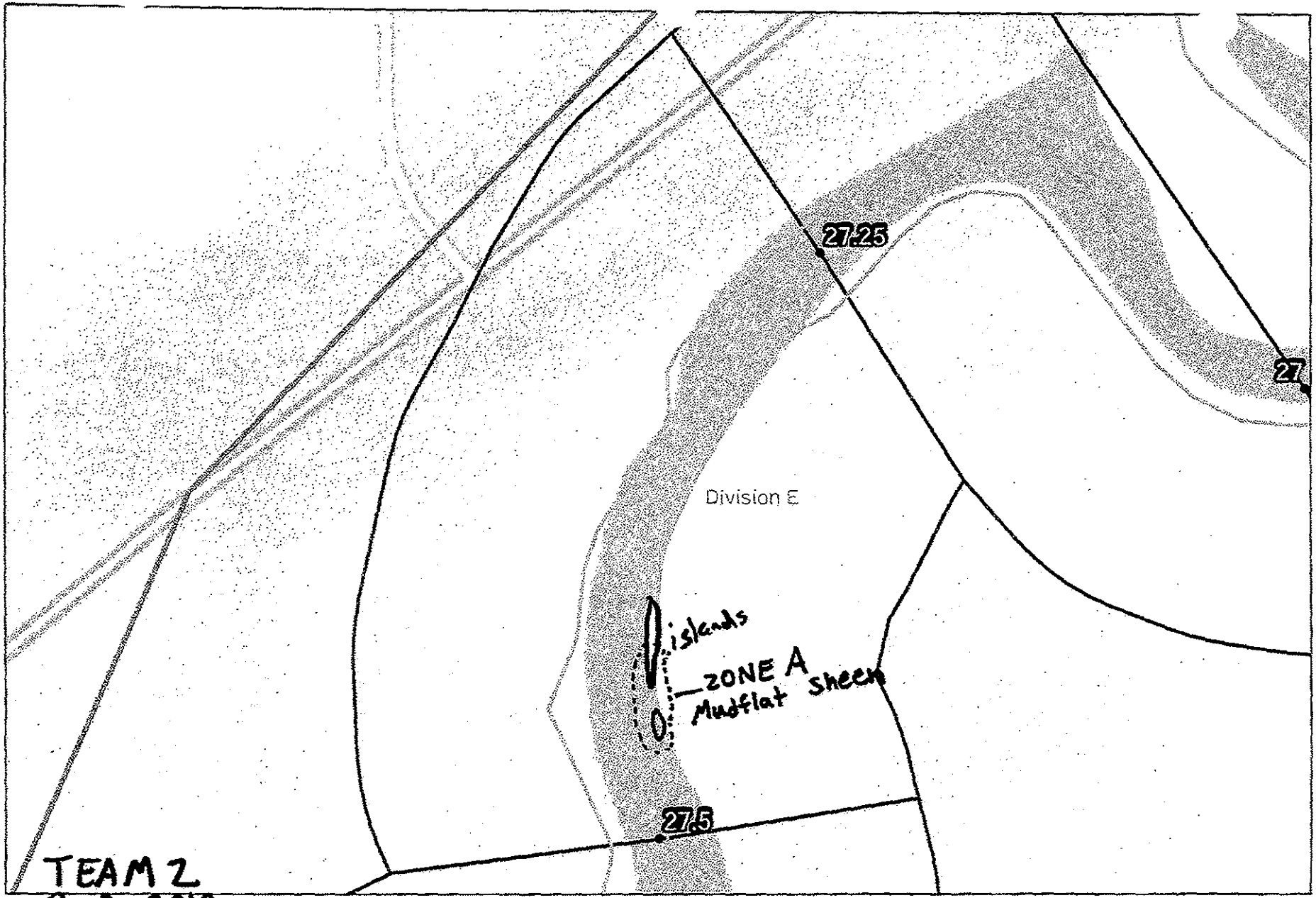
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

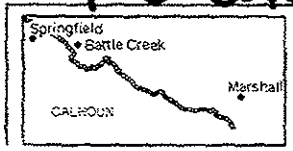
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

35.5 to 35.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

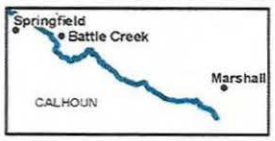
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 27.25-27.5 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 27.25-27.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography. USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 27.25 Start MP to End MP 27.50 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From** 27.25 **Start MP to End MP** 27.50 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 27.25 **to MP** 27.5 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK	8-30-10 (date)	Enbridge
Signature MJ MALINSKI	30 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Karen Van Tiem	9-7-10 (date)	Enbridge
Signature Christine R. Jump	9/7/10 (date)	EPA Larisa Leonova LARISA LEONOVA 9/7/10
Signature MATT WESSNER	9/8/10 (date)	MDNRE

5. **EPA**

Signature GARY LIPSON	9/7/10 (date)	EPA Division Supervisor

Appendix E
Photographs

Field Photo Log – Segment MP 27.50



Photo 0453 – Looking west at right descending bank.



Photo 0454 – Looking south at left descending bank.

Field Photo Log – Segment MP 27.50



Photo 0455 – Looking south at left descending bank.



Photo 0456 – Looking west at right descending bank.

Field Photo Log – Segment MP 27.50



Photo 0457 – Looking south at left descending bank. Near EPA-C-0569.



Photo 0458 – Looking south at island.

Field Photo Log – Segment MP 27.50



Photo 0459 – Looking west at right descending bank.



Photo 0460 – Looking northeast at left descending bank. Near EPA-C-0569.

Field Photo Log – Segment MP 27.50



Photo 0461 – Looking east at left descending bank. Near EPA-C-0569.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 27.75 – MP 27.50 to 27.75

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 27.75 had a small area of light oiling on the left descending bank and very light oiling on the right descending bank. The overbank contained no areas requiring clean-up and an island was present but conditions were documented in Segment 27.50. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 27.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

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  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

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Sediment Types

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B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
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P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

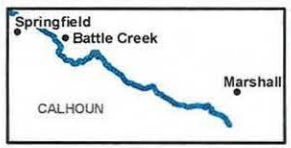
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 27.5-27.75 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 27.5-27.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

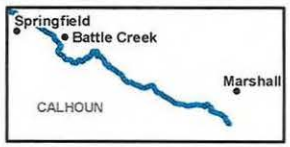
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 27.5-27.75 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 27.5-27.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 27.5 **to MP** 27.75 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK	8-30-10 (date)	Enbridge
Signature MJ NALEPINSKI	30 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Karen Van Tiem	9-7-10 (date)	Enbridge
Signature Christine R. Jump	9/7/10 (date)	EPA L. Leonora LARISA LEONOVA 9/7/
Signature MATT WESENER	9/8/10 (date)	MDNRE

5. **EPA**

Signature GARY LIPSON	9/17/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0462 – Looking west at right descending bank.



Photo 0463 – Looking southwest at left descending bank.



Photo 0464 – Looking west at right descending bank.



Photo 0465 – Looking southwest at left descending bank.



Photo 0466 – Looking southwest at left descending bank.



Photo 0467 – Looking north at right descending bank.



Photo 0468 – Looking southwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 28.00 – MP 27.75 to 28.00

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 28.00 had light to no oiling on the left descending bank and no oiling observed on the right descending bank. The overbank contained no oiled areas and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 28.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

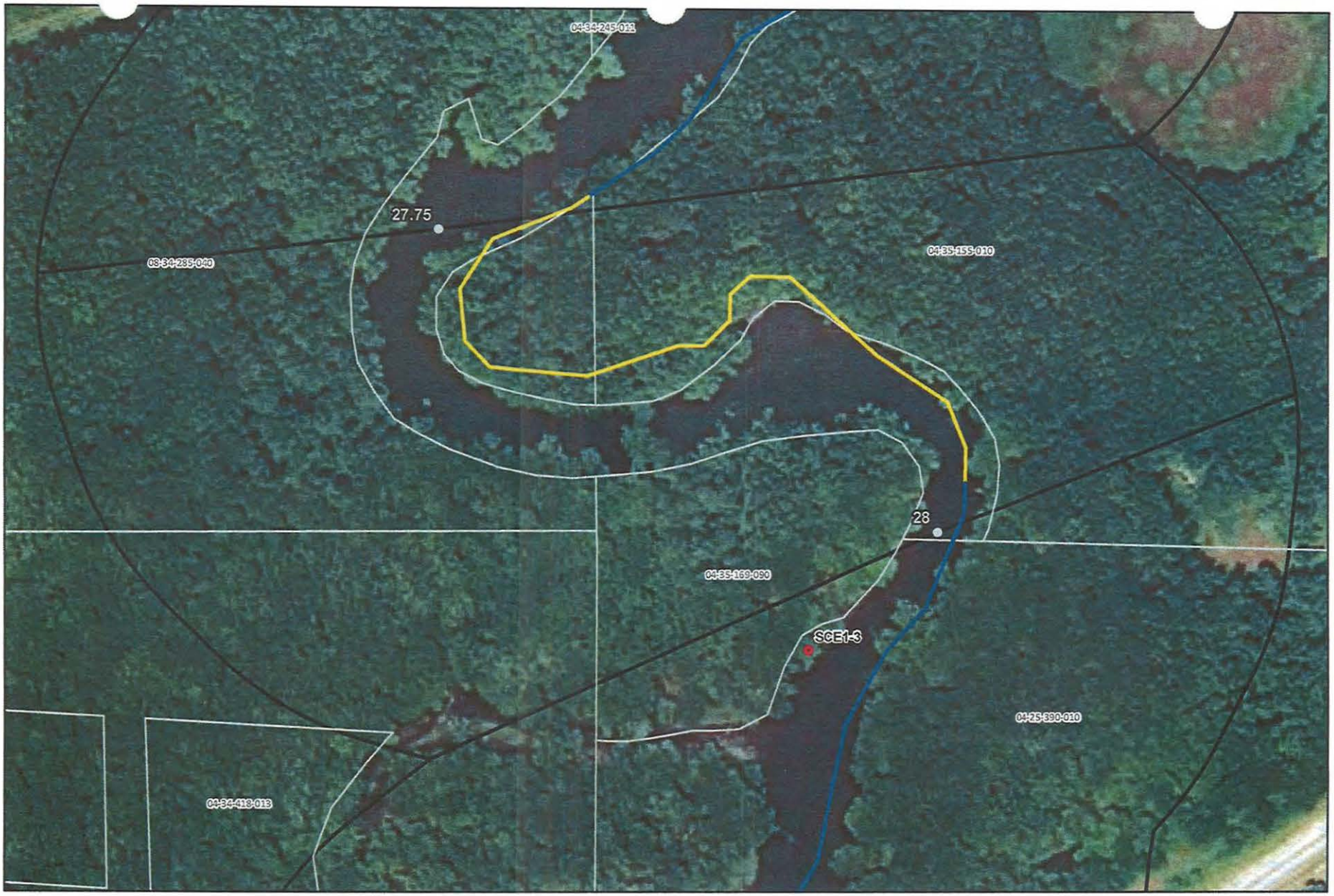
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

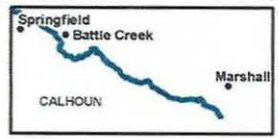
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Il. ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 27.75-28.0 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 27.75-28
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

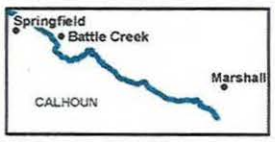
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release I.. ..nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 27.75-28.0 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 27.75-28
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 27.75 Start MP to End MP 28.00 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From** 27.75 **Start MP to End MP** 28.00 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: C **Segment ID: From MP** 27.75 **to MP** 28.0 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAM	8-30-10 (date)	Enbridge
Signature M J NALEPINSKI	30 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Long	9/7/2010 (date)	Enbridge	Karen Van Tiem 9-7-10 Karen Van Tiem
Signature Christine Jump	9/7/10 (date)	EPA	Gary A. Andrew 9.7.10 Gary A. Andrew
Signature MATT WESENER	9/8/10 (date)	MDNRE	Chris Conn 9-8-10

5. **EPA**

Signature GARY LIPSON	9/17/10 (date)	EPA Division Supervisor

Appendix E
Photographs

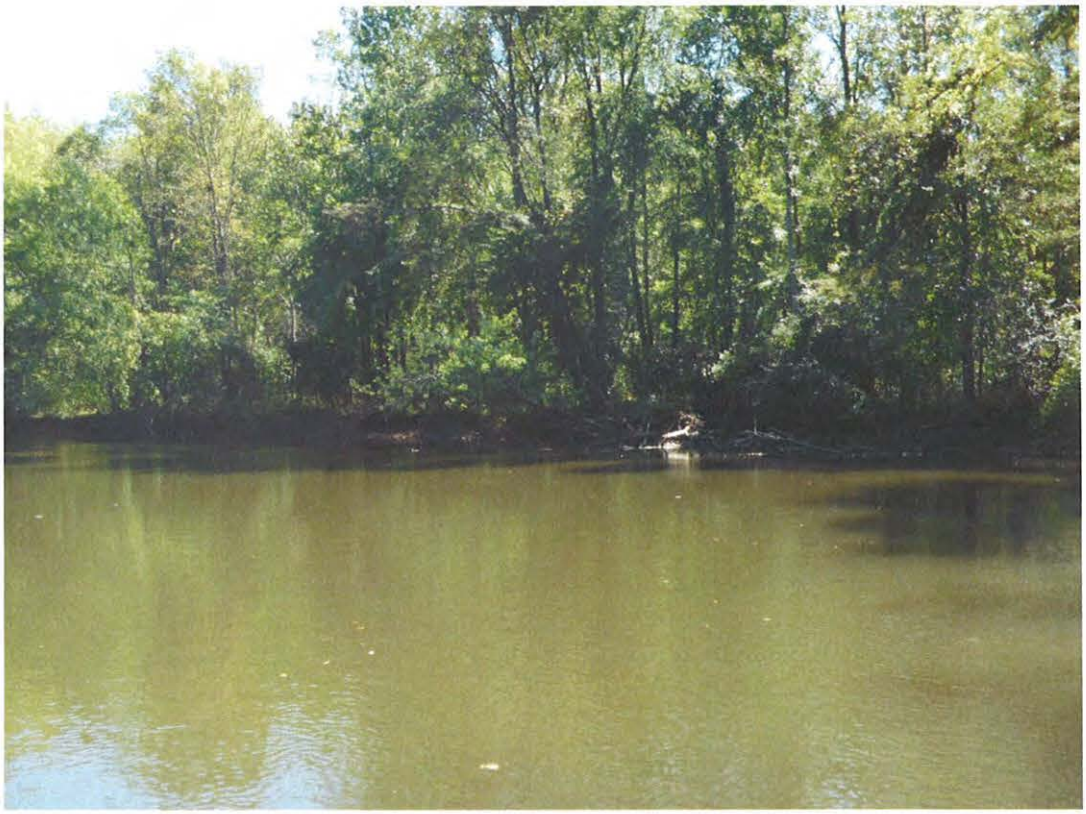


Photo 0469 – Looking southwest at right descending bank.



Photo 0470 – Looking east at left descending bank.



Photo 0471 – Looking west at right descending bank.



Photo 0472 – Looking east at left descending bank.



Photo 0473 – Looking east at left descending bank.



Photo 0474 – Looking northeast at left descending bank.



Photo 0475 – Looking north at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 28.25 – MP 28.00 to 28.25

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 28.25 had light oiling on the left descending bank and no oiling, other than some oil stained wood debris, on the right descending bank. The overbank contained no areas requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 28.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

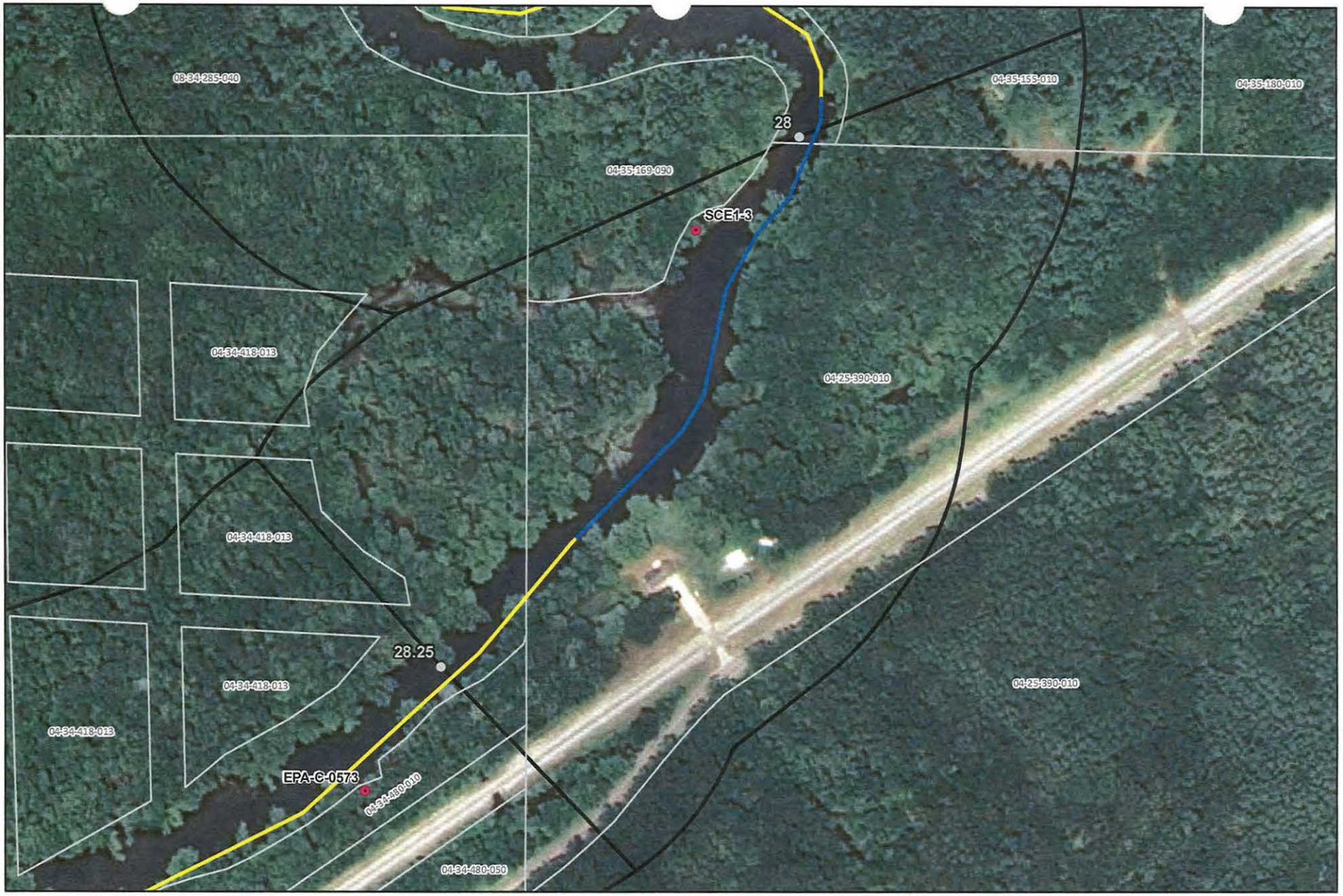
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 28.0-28.25 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 28-28.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 28.0-28.25 Right Bank While Looking Downstream										
SCE1-3	Shoreline	Shoreline Assessment	•			•	Oil stained wood stamps & branches.		42.33982	-85.33575





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 28-28.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 28.0 **to MP** 28.25 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☑

3. **Inspection**

Signature CHRISTOPHER HEATHCOCK 8-30-10 (date)		Enbridge
Signature MJ MALINSKI 30 Aug '10 (date)		EPA

4. **SCAT Reassessment**

Signature Rachael Van Loan 9/7/2010 (date)	Enbridge	Karen Van Tiem 9-7-10 Karen Van Tiem
Signature Christine R. Jump 9/7/10 (date)	EPA	Gary A. Andrew 9.7.10 Gary A. Andrew
Signature MATT NESSNER 9/8/10 (date)	MDNRE	Chris Conn 9-8-10

5. **EPA**

Signature GARY LIPSON 9/17/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0476 – Looking southwest at right descending bank.



Photo 0477 – Looking south at left descending bank.



Photo 0478 – Looking northwest at right descending bank. Near SCE1-3.



Photo 0479 – Looking north at right descending bank. Near SCE1-3.



Photo 0480 – Looking south at left descending bank.



Photo 0481 – Looking southwest at right descending bank.



Photo 0482 – Looking south at right descending bank.



Photo 0483 – Looking southwest at left descending bank.



Photo 0484 – Looking northwest at left descending bank.



Photo 0485 – Looking southwest at left descending bank.



Photo 0486 – Looking south at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 28.50 – MP 28.25 to 28.50

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 28.50 had light oiling on the left descending bank and no oiling observed on the right descending bank. Mudlflats near shore produce sheen when disturbed, recommended assessment to submerged oil team. The overbank contained no areas requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 28.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

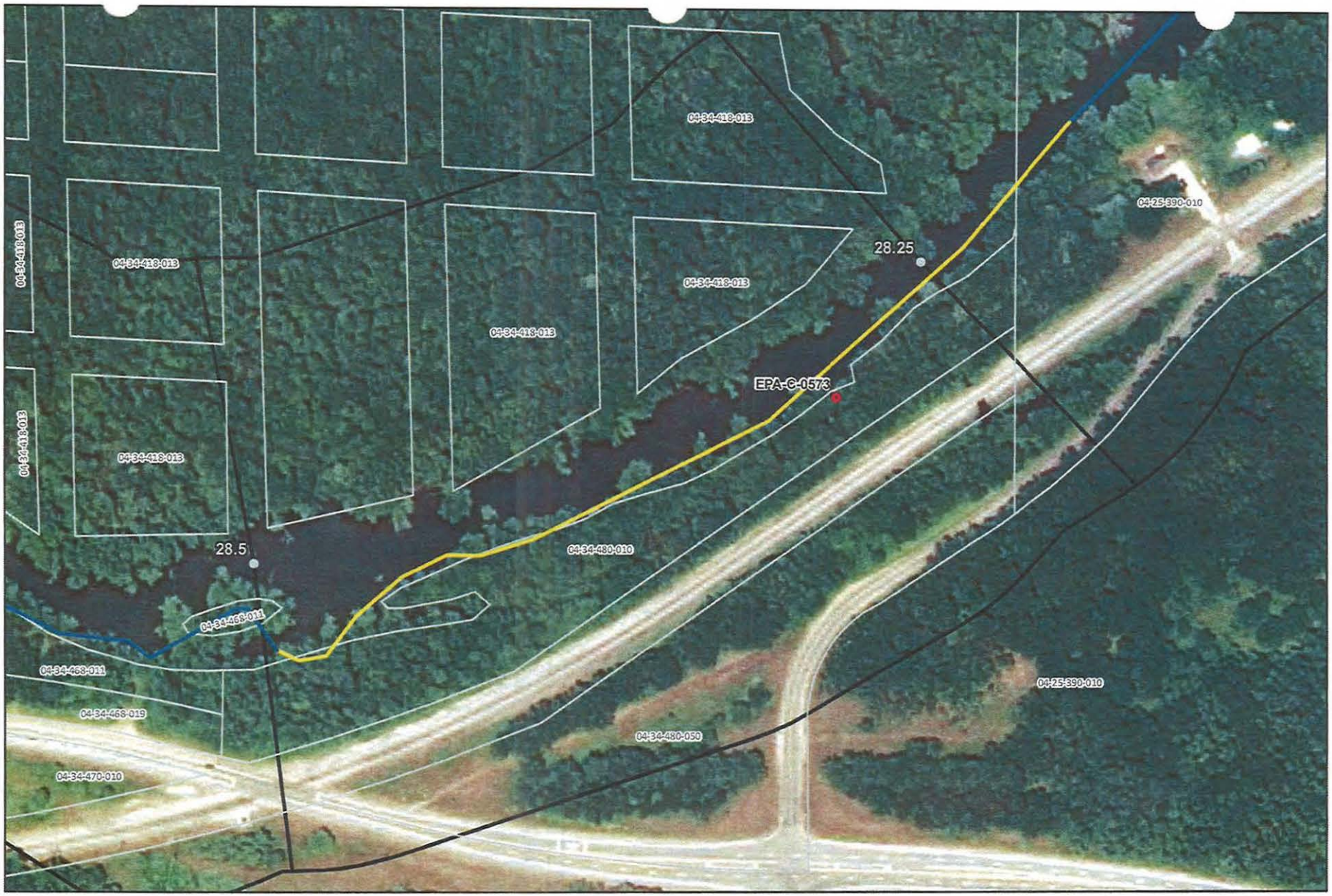
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

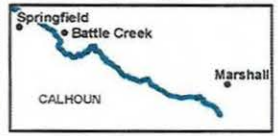
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Ir... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 28.25-28.5 Left Bank While Looking Downstream										
EPA-C-0573	Shoreline	SCAT T2 09/02/2010	Sheen observed on mudflat. When the mud is disturbed the oil is released and creates a thick sheen on the surface. Further assessment should be completed by the submerged oil team; No oil zones. However, there we did observe a sheen on the mud/sand banks along the edge of the river between segment 27.25 and 28.50.						42.33680	-85.33810





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category

- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Division E: Mile Marker 28.25-28.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

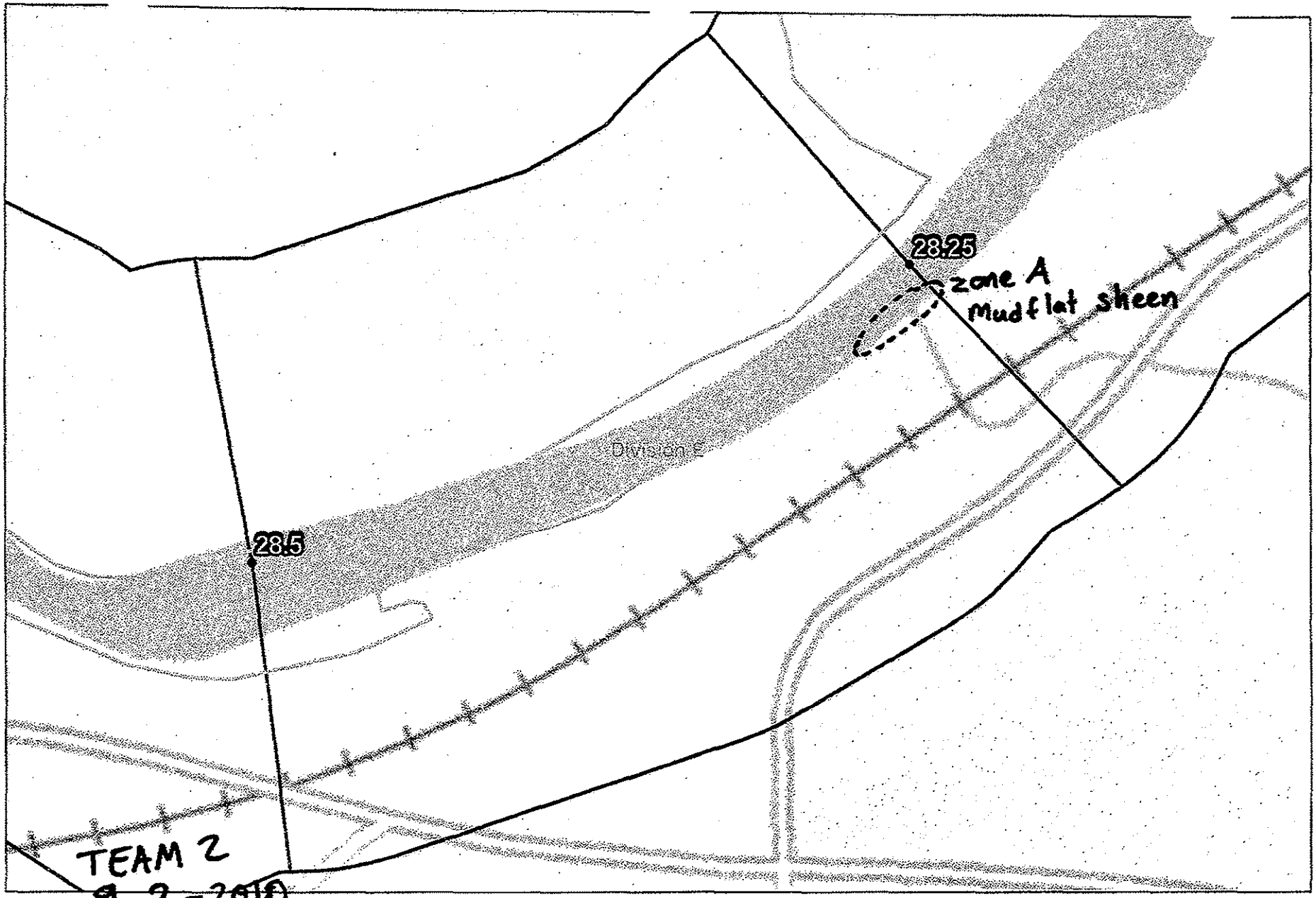
0 75 150 Feet

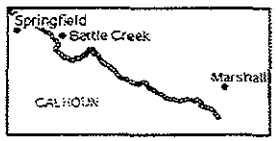
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

35.5 to 35.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

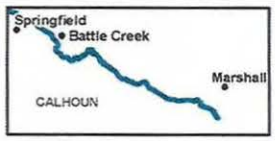
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 28.25-28.5 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 28.25-28.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 28.25 Start MP to End MP 28.50 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From** 28.25 **Start MP to End MP** 28.50 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 28.25 **to MP** 28.5 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK	8-30-10 (date)	Enbridge	
Signature MJ MALINOWSKI	30 Aug '10 (date)	EPA	

4. **SCAT Reassessment**

Signature Michael Van Loan	9/7/2010 (date)	Enbridge	Karen Van Tiem 9-7-10 Karen Van Tiem
Signature Christine R. Jump	9/7/10 (date)	EPA	Gary A. Andrew 9.7.10 Gary A. Andrew
Signature MATT WESENER	9/8/10 (date)	MDNRE	Chris Conn 9-8-10

5. **EPA**

Signature GARY LIPSON	9/17/10 (date)	EPA Division Supervisor

Appendix E
Photographs



Photo 0487 – Looking northwest at right descending bank.



Photo 0488 – Looking southwest at left descending bank.

Field Photo Log – Segment MP 28.50



Photo 0489 – Looking northwest at right descending bank.



Photo 0490 – Looking east at left descending bank.

Field Photo Log – Segment MP 28.50



Photo 0491 – Looking east at left descending bank. Near EPA-C-0573.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 28.75 – MP 28.50 to 28.75

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 28.75 had no oiling present on the left descending bank and very light oiling on a portion of the right descending bank. The overbank contained no areas requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 28.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

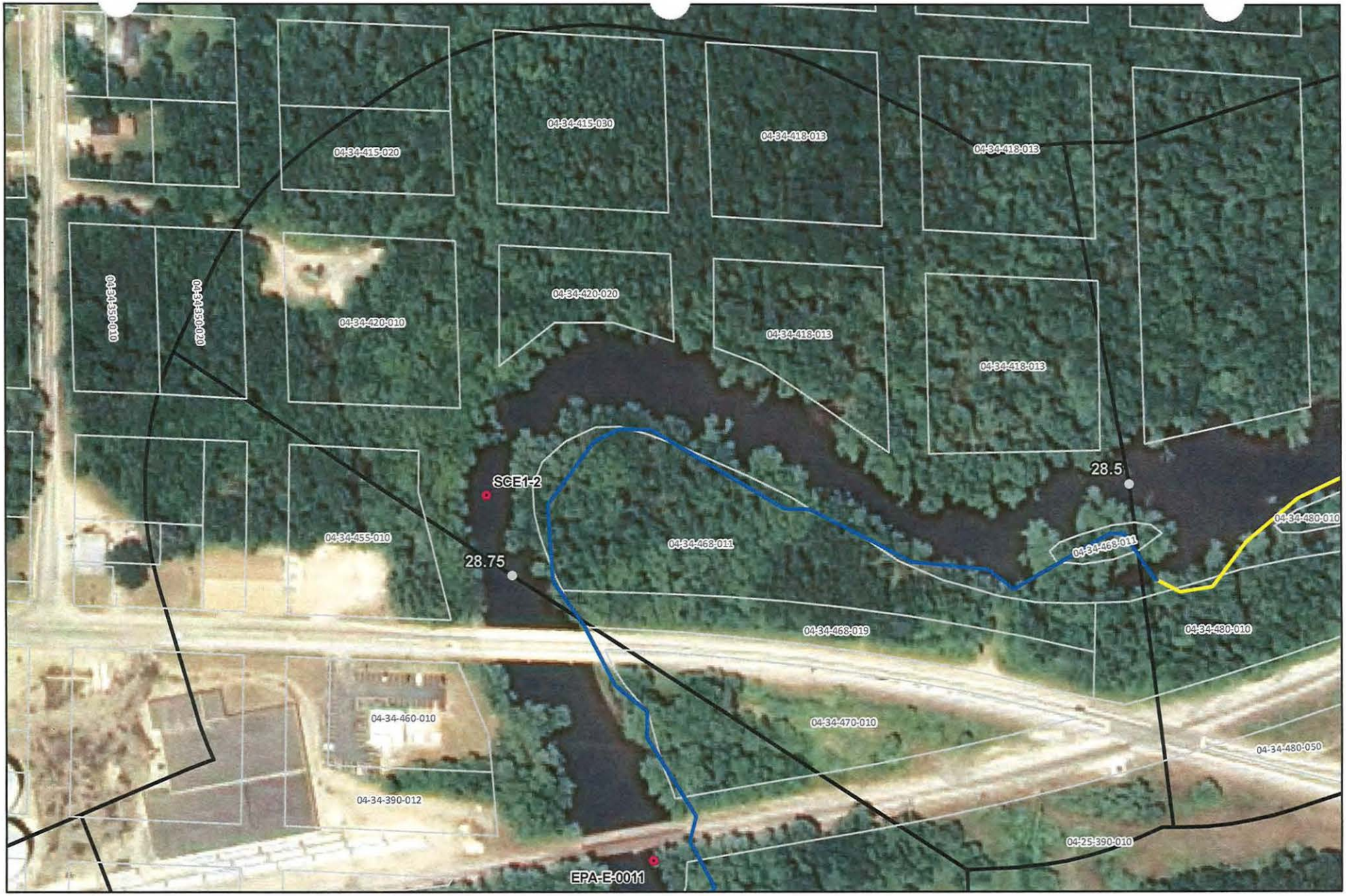
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Ir.. .nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 28.5-28.75 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 28.5-28.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 28.5-28.75 Right Bank While Looking Downstream										
SCE1-2	Shoreline	Shoreline Assessment					Booms left high after water river stage has receded; Need to redeploy from this point and upstream.	Need to redeploy booms from this point and upstream.	42.33588	-85.34560





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 28.5-28.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 28.50 **to MP** 28.75 **Segment Length: 0.25 mile**

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**

Signature Ken Lostley (date) 11-Sept-2010 Enbridge

Signature Eduardo Rovira (date) 9/11/10 EPA

4. **SCAT Reassessment**

Signature Mike Van Loun (date) 9/12/10 Enbridge

Signature ROSS DEL ROSARIO (date) 9/12/10 EPA

Signature ERNEST SARKIPATO (date) 9/12/10 MDNRE

5. **EPA**

Signature GARY LIPSON (date) 9/17/10 EPA Division Supervisor

Appendix E
Photos



Photo 0492 – Looking west at left descending bank.



Photo 0493 – Looking west at island.



Photo 0494 – Looking north at right descending bank.



Photo 0495 – Looking southwest at island.



Photo 0496 – Looking west at right descending bank.



Photo 0497 – Looking east at left descending bank.



Photo 0498 – Looking west at left descending bank.



Photo 0499 – Looking north at right descending bank.



Photo 0500 – Looking west at left descending bank.



Photo 0501 – Looking northwest at right descending bank.



Photo 0502 – Looking west at right descending bank. Near SCE1-2.



Photo 0503 – Looking west at right descending bank.

Field Photo Log – Segment MP 28.75



Photo 0504 – Looking south at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 29.0 – MP 28.75 to 29.0

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 29.00 had no oiling on the left descending bank and very light oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present.

Actions

The light oiling on the right descending bank occurred on soil substrate, and the SCAT recommendation is to leave the oiled soil in place. As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

Some oiling was not removed to help ensure the preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Very lightly oiled sediment along the right descending bank.

Segment 29.00 has reached the operational endpoints pursuant to the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

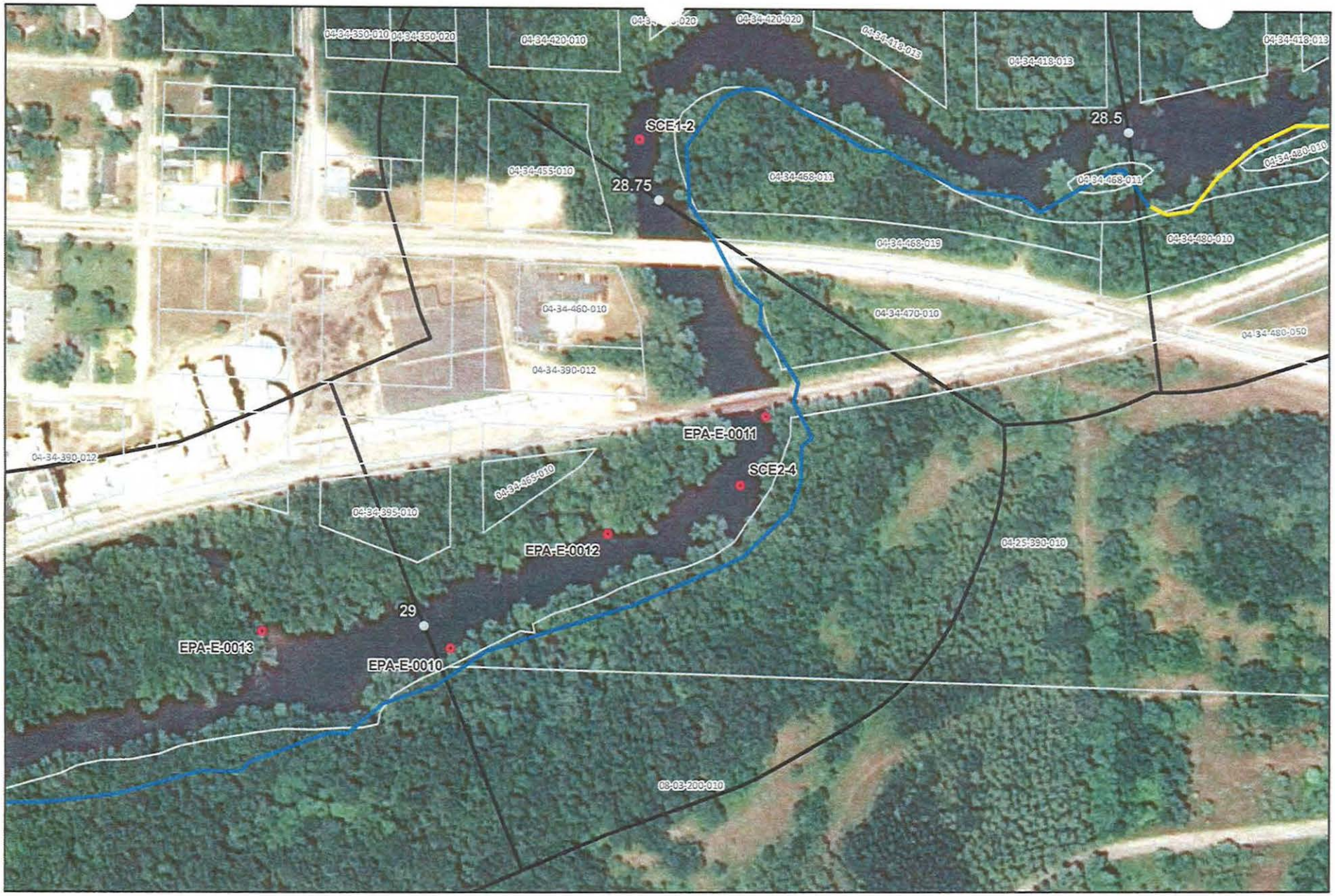
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 28.75-29.0 Left Bank While Looking Downstream										
EPA-E-0010	Main Channel	SCAT T1 8/19/2010	No oil						42.33302	-85.34698
EPA-E-0011	Main Channel	SCAT T1 8/19/2010	End of LDB up to bridge. Turned around to do RDB						42.33433	-85.34462





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 28.75-29
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

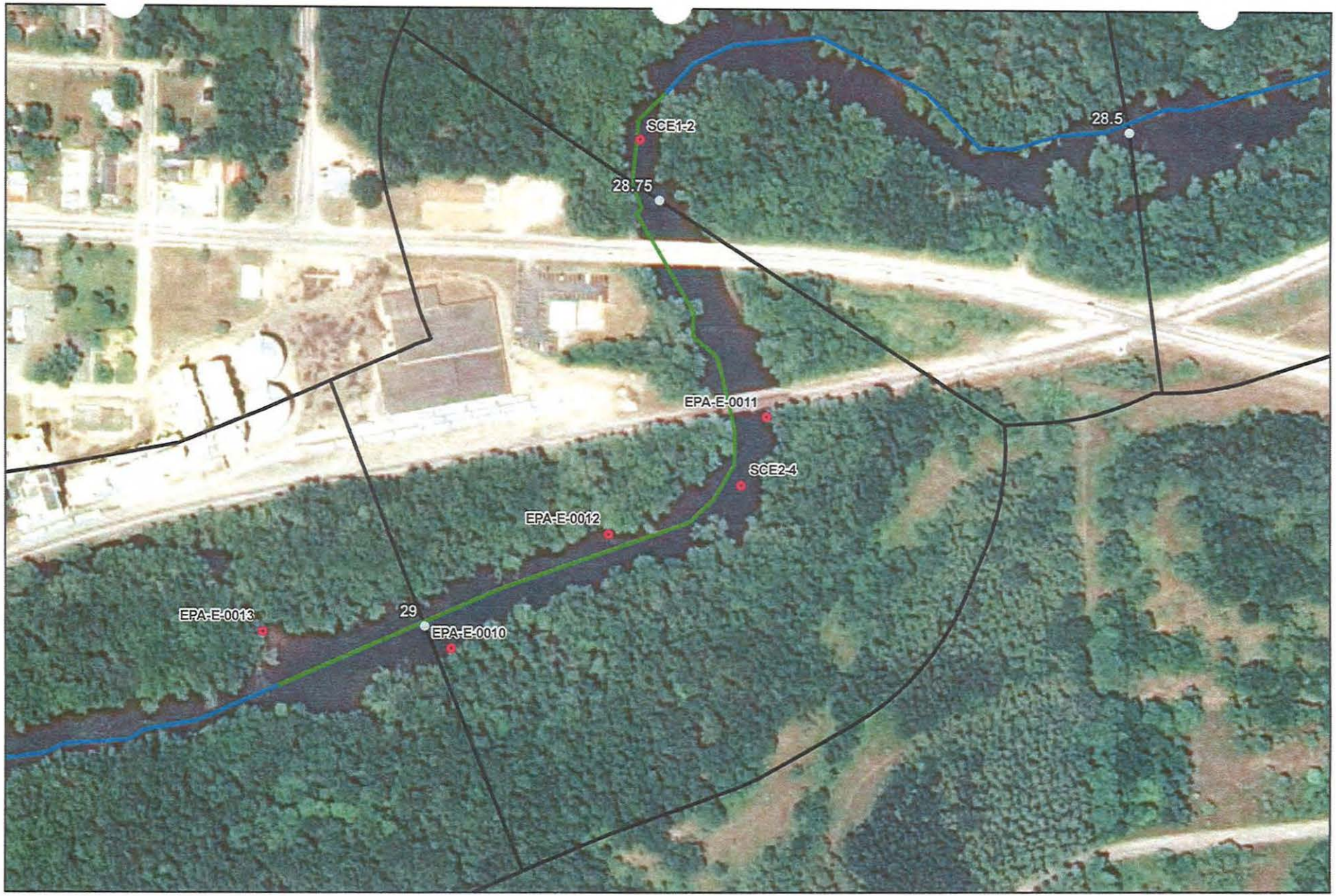
Source: Aerial Photography: USDA, 2009.

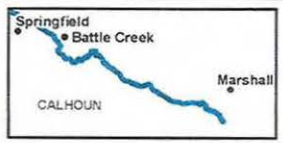
ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 28.75-29.0 Right Bank While Looking Downstream										
EPA-E-0012	Main Channel	SCAT T1 8/19/2010	Pic - 443, 442 are of WP-178. Stop to investigate. When boat hit Shoreline, film came from sediments. There was also some bacterial sheen in the area as well. Pictures show differences between the two types of sheen						42.33367	-85.34580





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 28.75-29
Right Bank While Looking Downstream

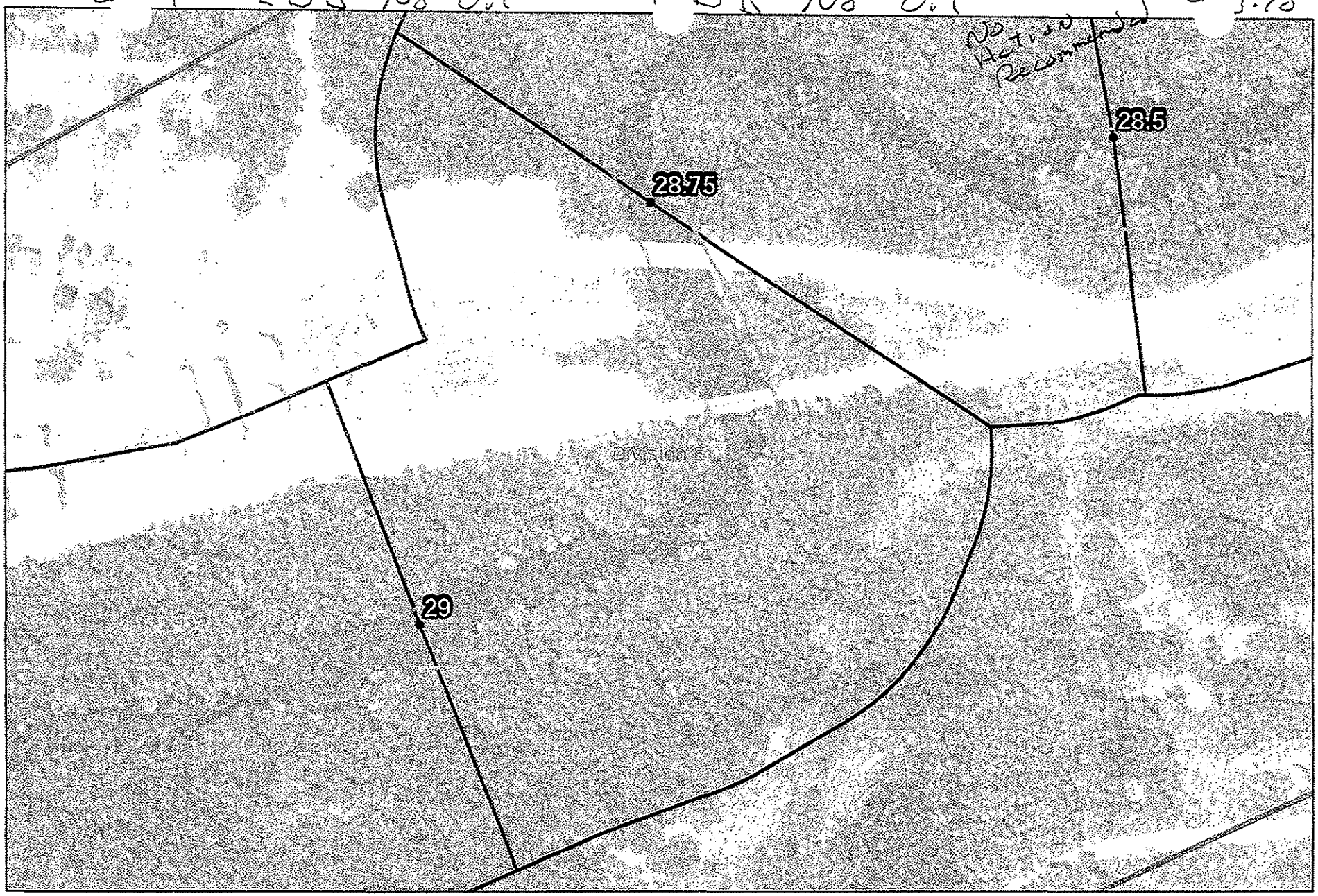
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



Springfield
Battle Creek
Marshall
CALHOUN

Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

28.75-29

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

SCAT Assessment determined that no cleanup operations were necessary.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 28.25 **to MP** 29.0 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAVA	8-30-10 (date)	Enbridge
Signature MJ MALIPINSKI	30 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Loan	09/05/2010 (date)	Enbridge
Signature Gary A. Andrew	9-5-10 (date)	EPA
Signature Kenneth M. Mroczkowski	9/05/2010 (date)	MDNRE

5. **EPA**

Signature	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 29.00



Photo 0173 – Looking northeast at left descending bank.



Photo 0174 – Looking northwest at right descending bank.

Field Photo Log – Segment MP 29.00



Photo 0175 – Looking northwest at right descending bank.



Photo 0176 – Looking south at left descending bank. GPS point EPA-E-0011.



Photo 0177 – Looking south at left descending bank. GPS point SCE2-4.



Photo 0178 – Looking west at right descending bank. GPS point EPA-E-0012.

Field Photo Log – Segment MP 29.00

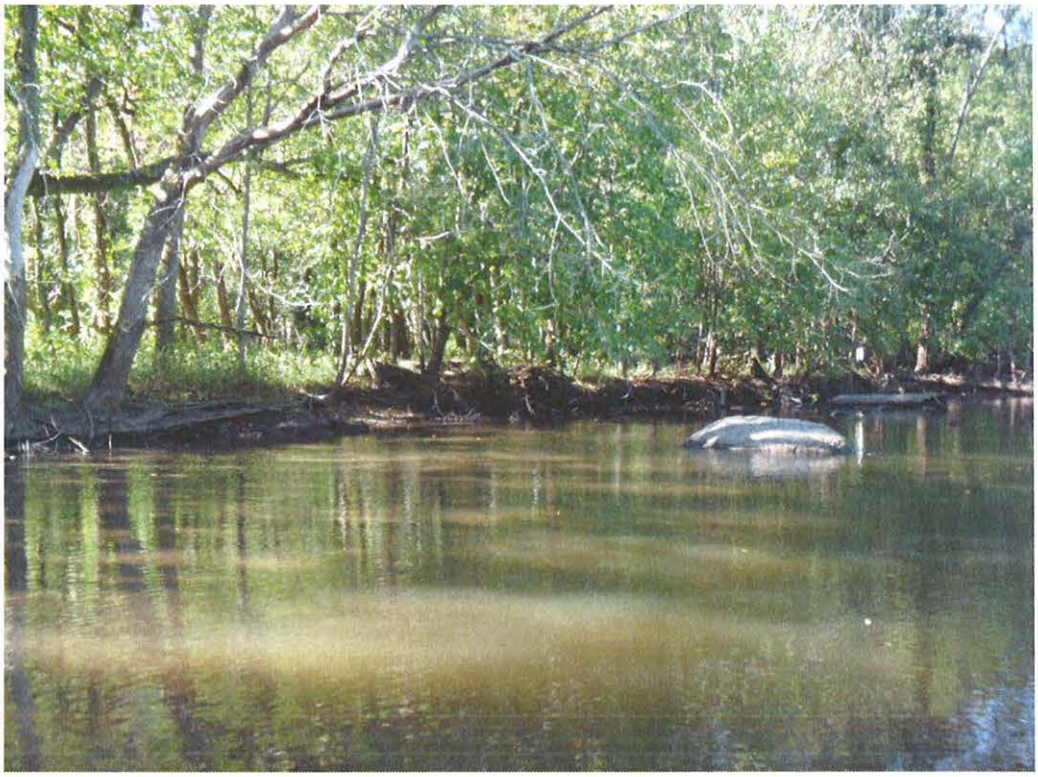


Photo 0179 – Looking south at left descending bank. GPS point EPA-E-0010.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 29.25 – MP 29.00 to 29.25

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 29.25 had no oiling on the left descending bank and very light oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up. One island was present, but no oiling was observed on the shoreline.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Very lightly oiling the right descending bank.

No oiled conditions exist. Segment 29.25 has reached the operational endpoints pursuant to the 5-step process. The appendices attached prove additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

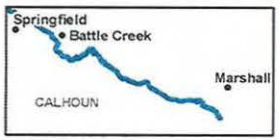
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 29.0-29.25 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Division E: Mile Marker 29-29.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

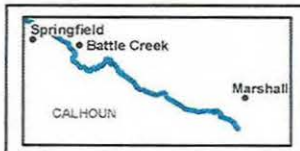
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 29.0-29.25 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 29-29.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

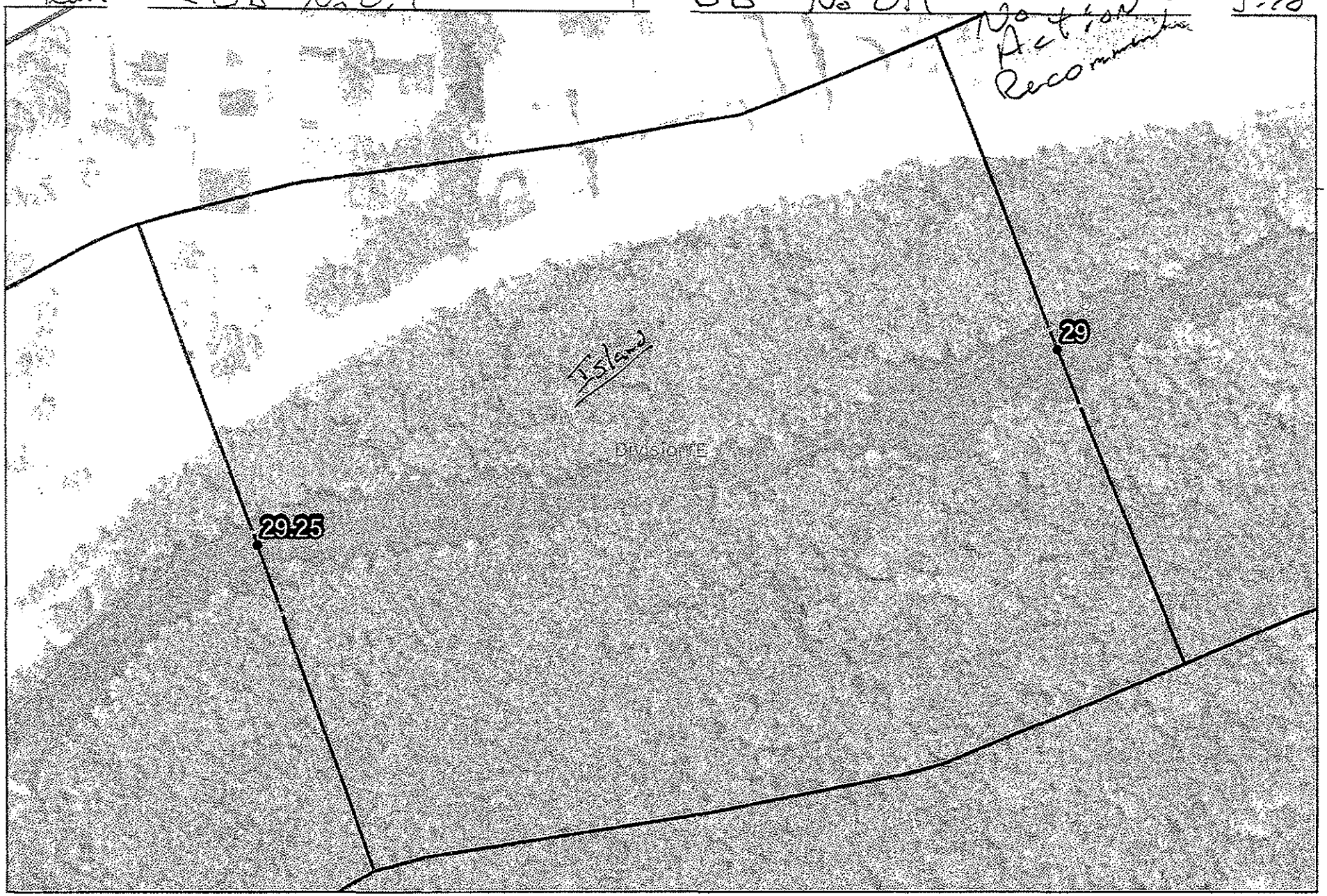
Source: Aerial Photography: USDA, 2009.

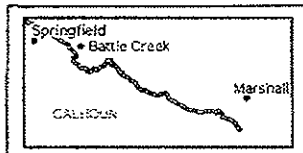
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team: LDB No Oil LDB No Oil No Action Recommended 3-10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

29-29.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 29.0 **to MP** 29.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAUK	9-1-10 (date)	Enbridge
Signature MJ NIHLINSKI	1 Sept '10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Loan	09/05/2010 (date)	Enbridge
Signature Gary A. Andrews	9.5.10 (date)	EPA
Signature Kenneth M. Mroczkowski	09/05/2010 (date)	MDNRE

5. **EPA**

Signature	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 29.25



Photo 0180 – Looking west at right descending bank.



Photo 0181 – Looking southwest at left descending bank.

Field Photo Log – Segment MP 29.25



Photo 0182 – Looking north at right descending bank. GPA point EPA-E-0013.



Photo 0183 – Looking southwest at left descending bank.

Field Photo Log – Segment MP 29.25



Photo 0184 – Looking northwest at right descending bank.



Photo 0185 – Looking southwest at left descending bank.

Field Photo Log – Segment MP 29.25

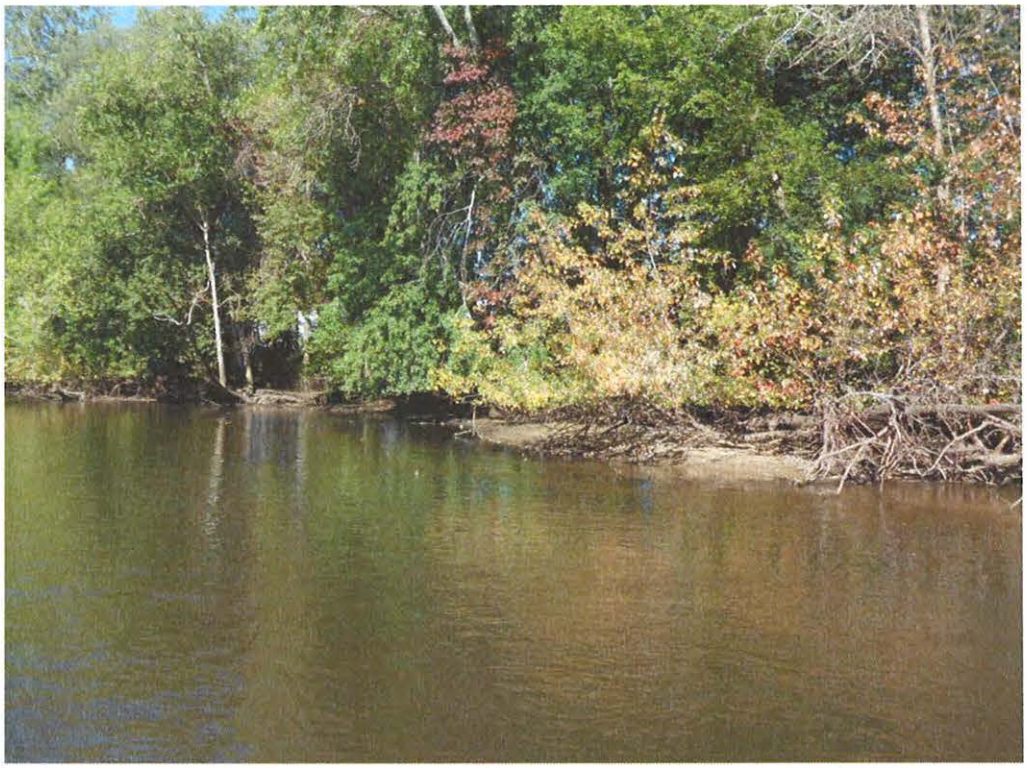


Photo 0186– Looking northwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 29.5 – MP 29.25 to 29.5

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 29.50 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 29.50 has reached operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, inciplent asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

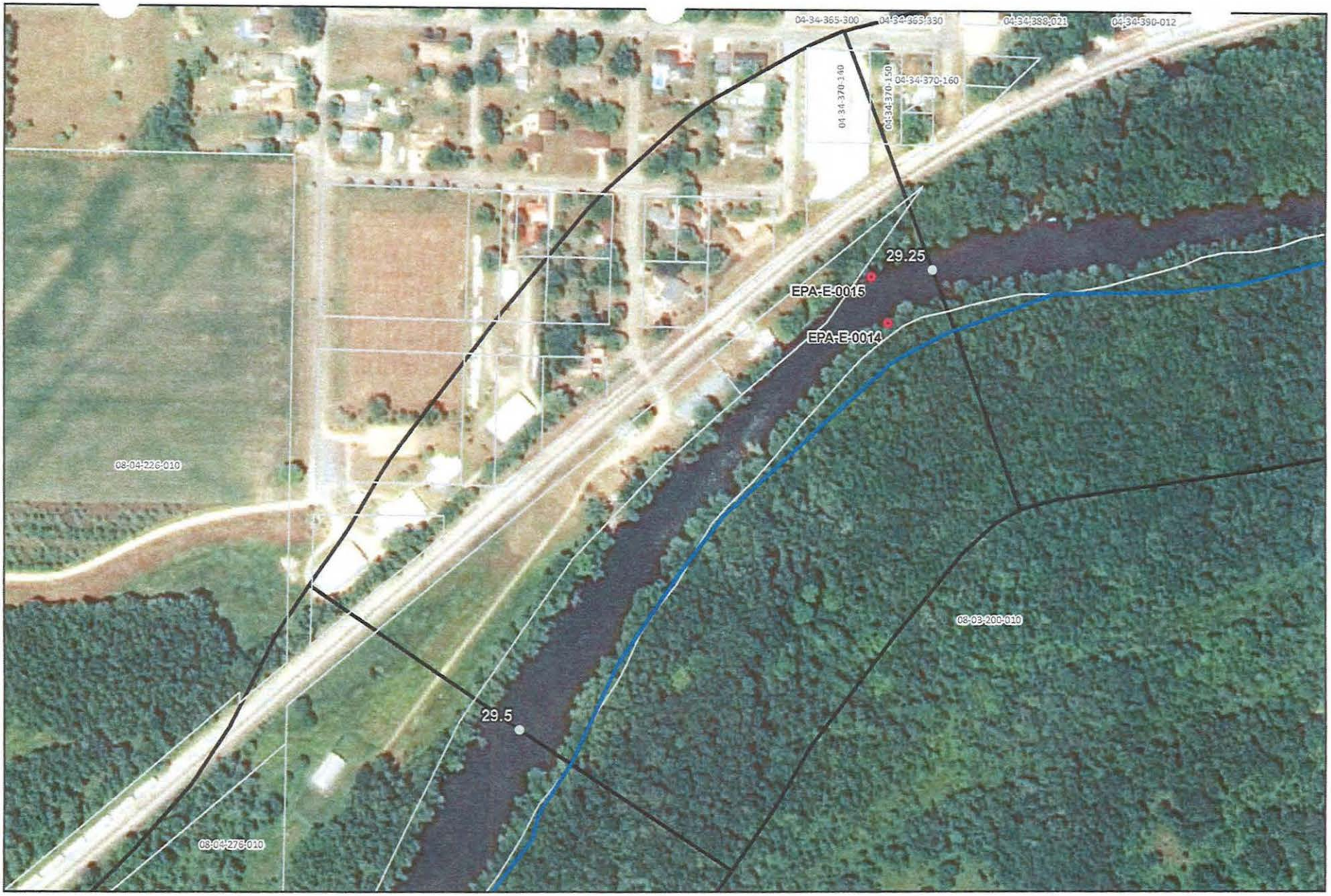
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

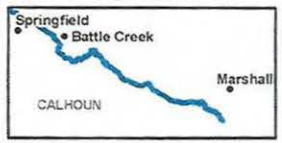
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 29.25-29.5 Left Bank While Looking Downstream										
EPA-E-0014	Main Channel	SCAT T1 8/19/2010	No oil						42.33193	-85.35223





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 29.25-29.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

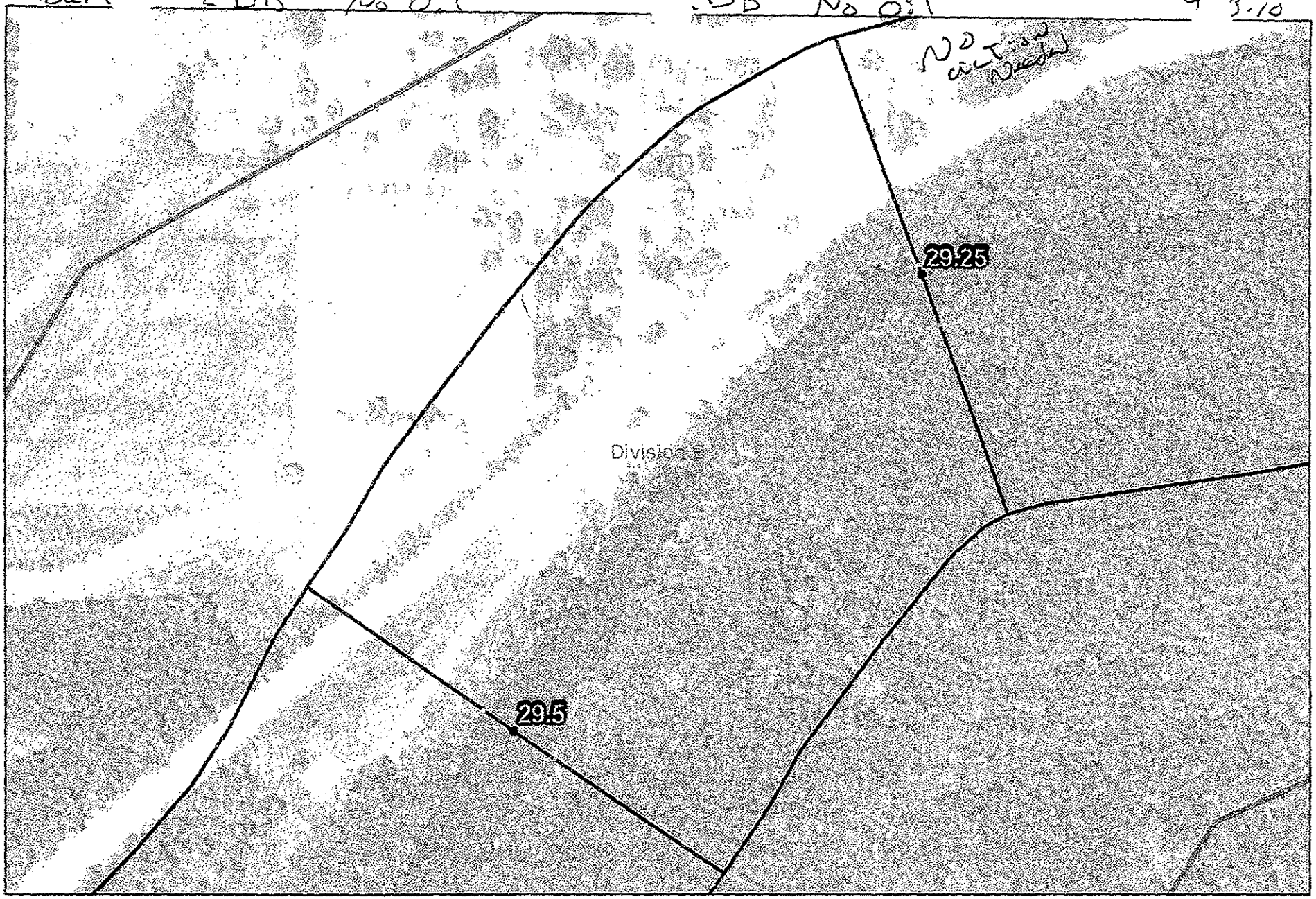
0 75 150
Feet

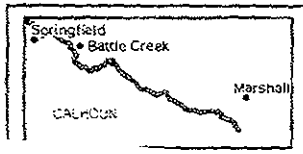
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team LDB No Oil LDB No Oil 4 3.10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

29.25-29.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

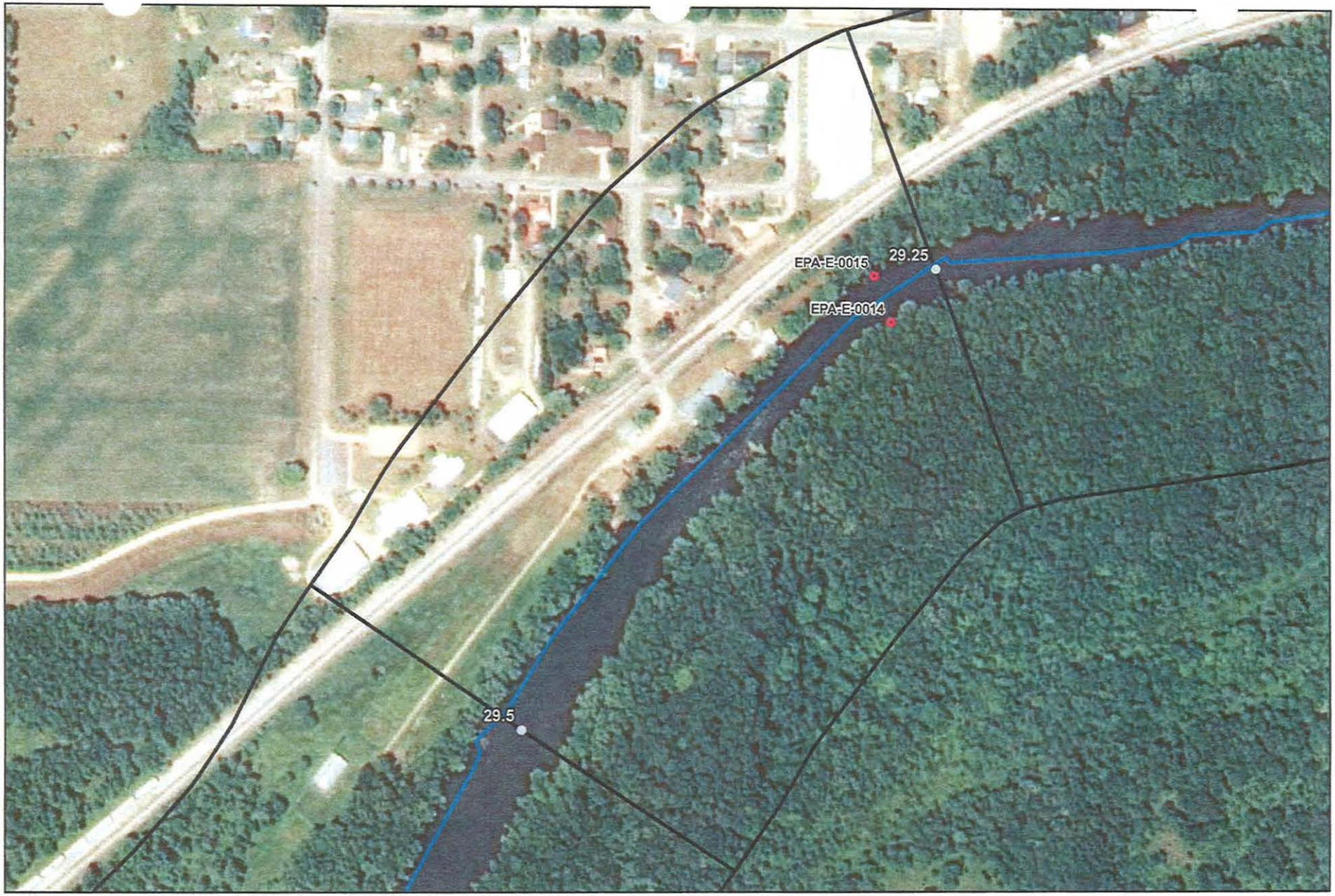
ENTRIX

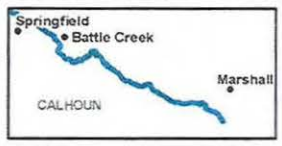
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 29.25-29.5 Right Bank While Looking Downstream										
EPA-E-0015	Main Channel	SCAT T1 8/19/2010	Very little oil, some isolated films and sheens around snags						42.33220	-85.35237





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 29.25-29.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From**_____ **Start MP to End MP**_____ **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 29.25 **to MP** 29.5 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAUK	9-1-10 (date)	Enbridge
Signature M J NALIPINSKI	1 Sept '10 (date)	EPA

4. **SCAT Reassessment**

Signature Richard Van Loan	09/05/2010 (date)	Enbridge
Signature Gary A. Andrew	9.5.10 (date)	EPA
Signature Kenneth M. Mrocakowski	09/05/2010 (date)	MDNRE

5. **EPA**

Signature	9/13/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 29.50



Photo 0187 – Looking west at right descending bank. GPA at EPA-E-0015



Photo 0188 – Looking southwest at left descending bank. GPA at EPA-E-0014

Field Photo Log – Segment MP 29.50



Photo 0189 – Looking west at right descending bank.



Photo 0190 – Looking southwest at left descending bank.

Field Photo Log – Segment MP 29.50



Photo 0191 – Looking southwest at right descending bank.



Photo 0192 – Looking northwest at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 29.75 – MP 29.5 to 29.75

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 29.75 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 29.75 has reached operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

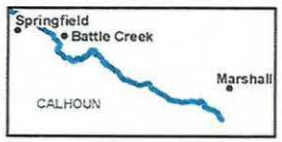
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 29.5-29.75 Left Bank While Looking Downstream										
EPA-E-0016	Main Channel	SCAT T1 8/19/2010	No oil						42.32860	-85.35558





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 29.5-29.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

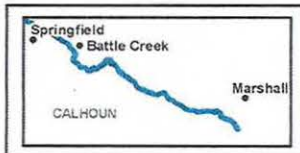
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 29.5-29.75 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 29.5-29.75
Right Bank While Looking Downstream

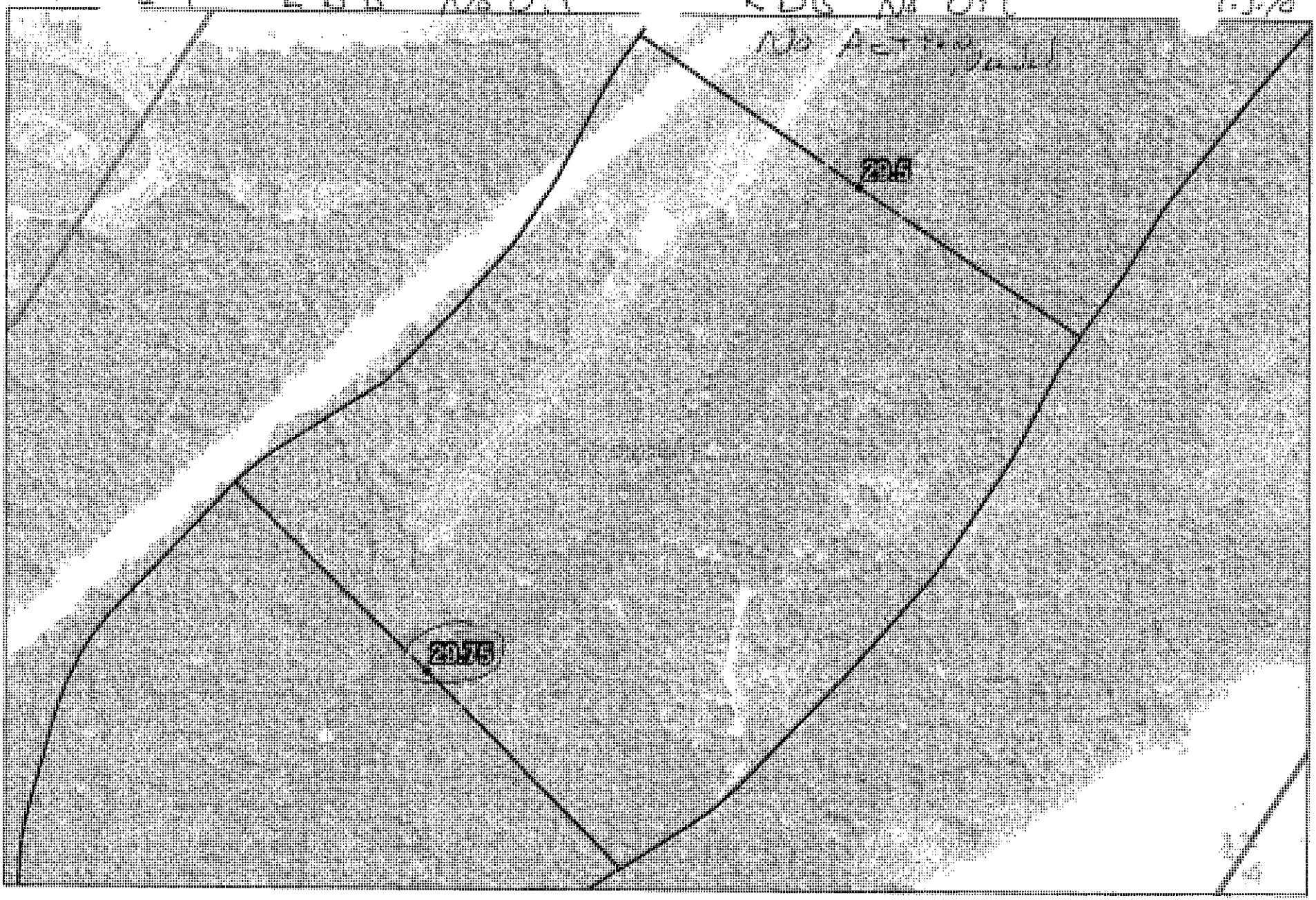
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

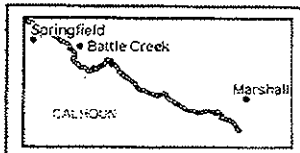
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

29.5-29.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From**_____ **Start MP to End MP**_____ **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Revetted – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 29.5 **to MP** 29.75 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAUK	9-1-10 (date)	Enbridge
MJ Kaliszewski MJ KALISZEWSKI	1 Sept '10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Loan	09/05/2010 (date)	Enbridge
Signature Gary A. Andrews	9.5.10 (date)	EPA
Signature Kenneth M. Mroczkowski	09/05/2010 (date)	MDNRE

5. **EPA**

Signature	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 29.75



Photo 0193 – Looking south at left descending bank.



Photo 0194 – Looking southwest at right descending bank.

Field Photo Log – Segment MP 29.75

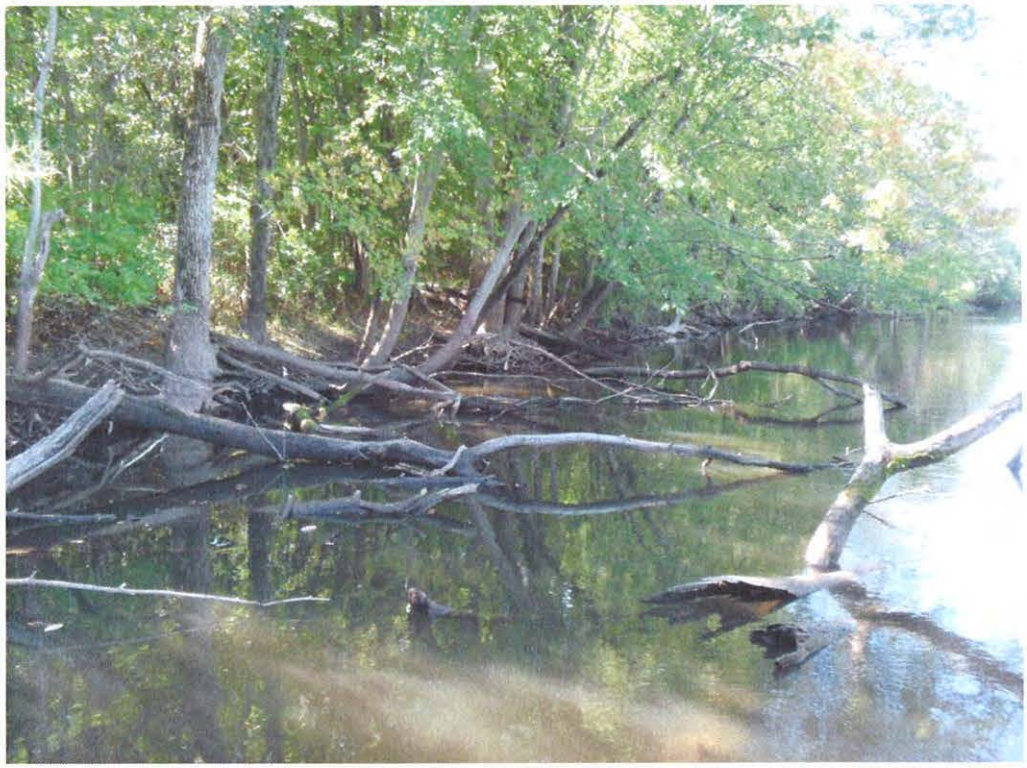


Photo 0195 – Looking south at left descending bank. Near EPA-E-0016



Photo 0196 – Looking southwest at right descending bank.

Field Photo Log – Segment MP 29.75



Photo 0197 – Looking south at left descending bank.



Photo 0198 – Looking southwest at right descending bank.

Field Photo Log – Segment MP 29.75



Photo 0199 – Looking southwest at right descending bank.



Photo 0200 – Looking south at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 30.0 – MP 29.75 to 30.0

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 30.00 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 30.00 has reached operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

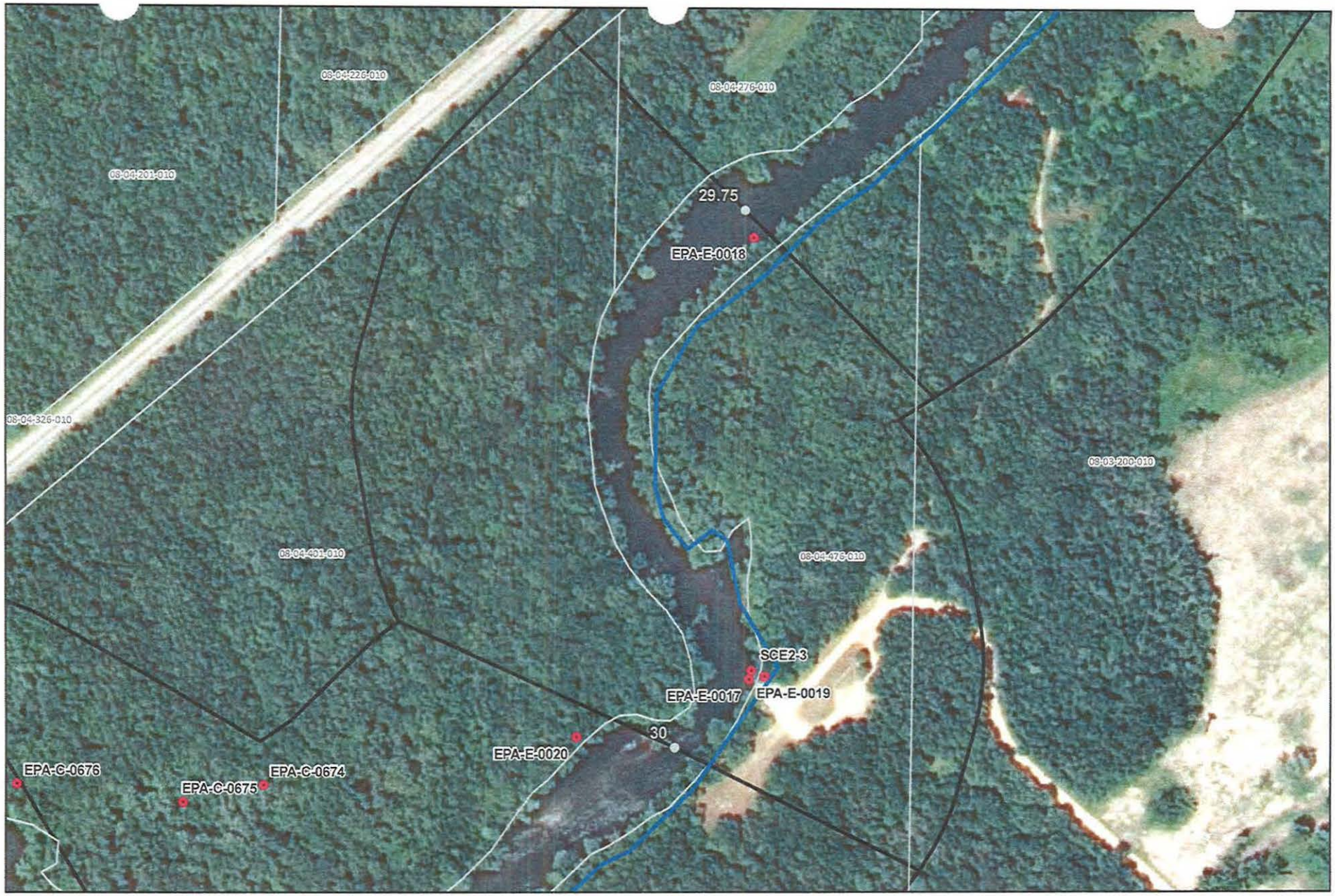
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

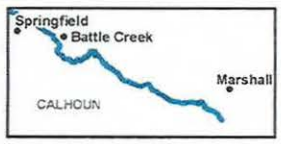
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Ir. nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 29.75-30.0 Left Bank While Looking Downstream										
EPA-E-0018	Main Channel	SCAT T1 8/19/2010	All Shoreline was clean, no oil staining, film, cover etc.						42.32673	-85.35817
EPA-E-0019	Main Channel	SCAT T1 8/19/2010	WP-189-190 - no oil observed						42.32425	-85.35805





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 29.75-30
Left Bank While Looking Downstream

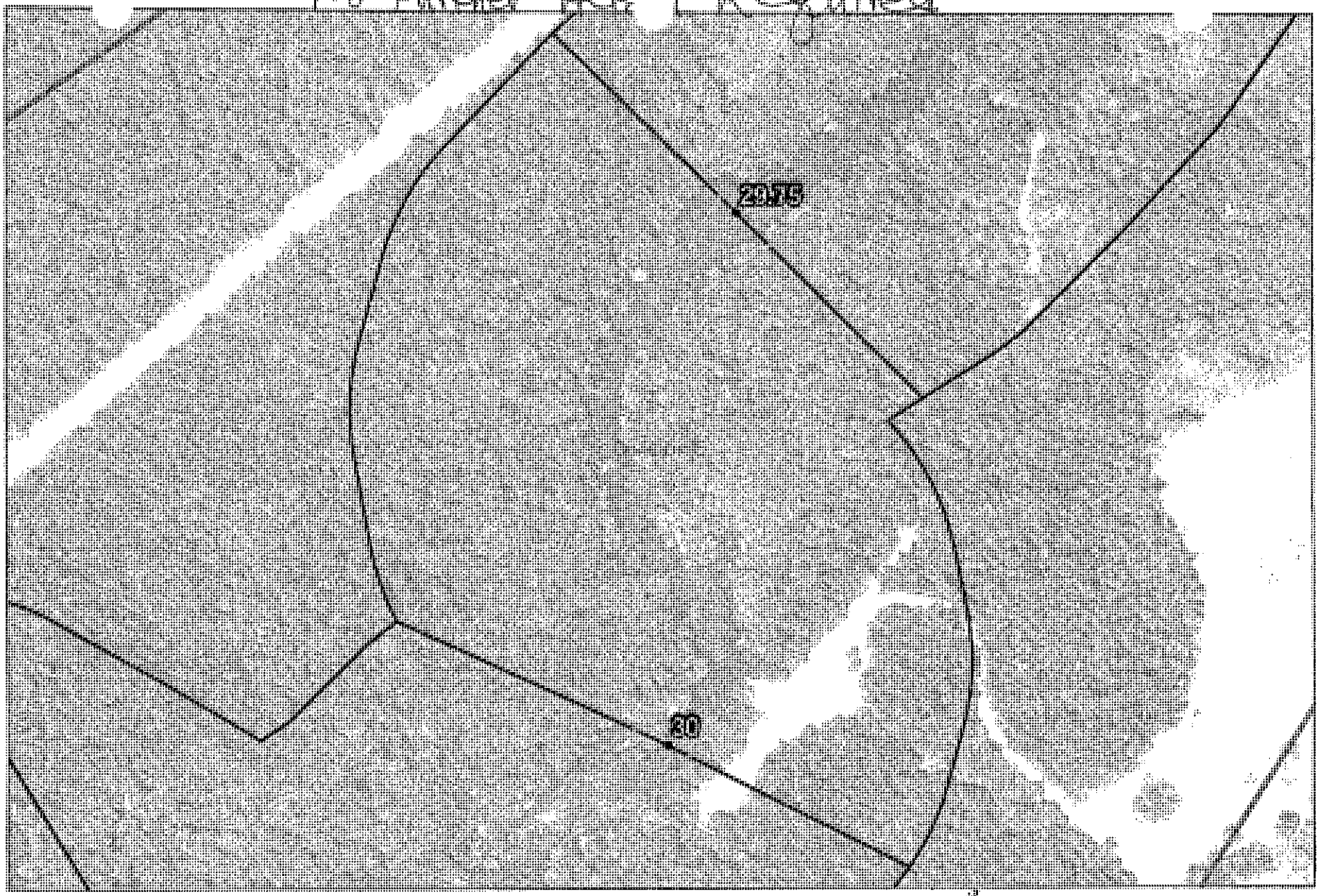
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

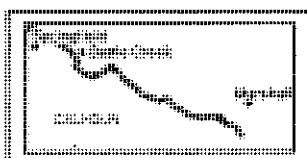
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

No Further Action Required





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

TEAM 1

NO OIL

6/2/10

35.5 to 35.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

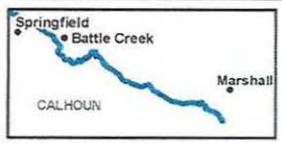
ENTRIX

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 29.75-30.0 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 29.75-30
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

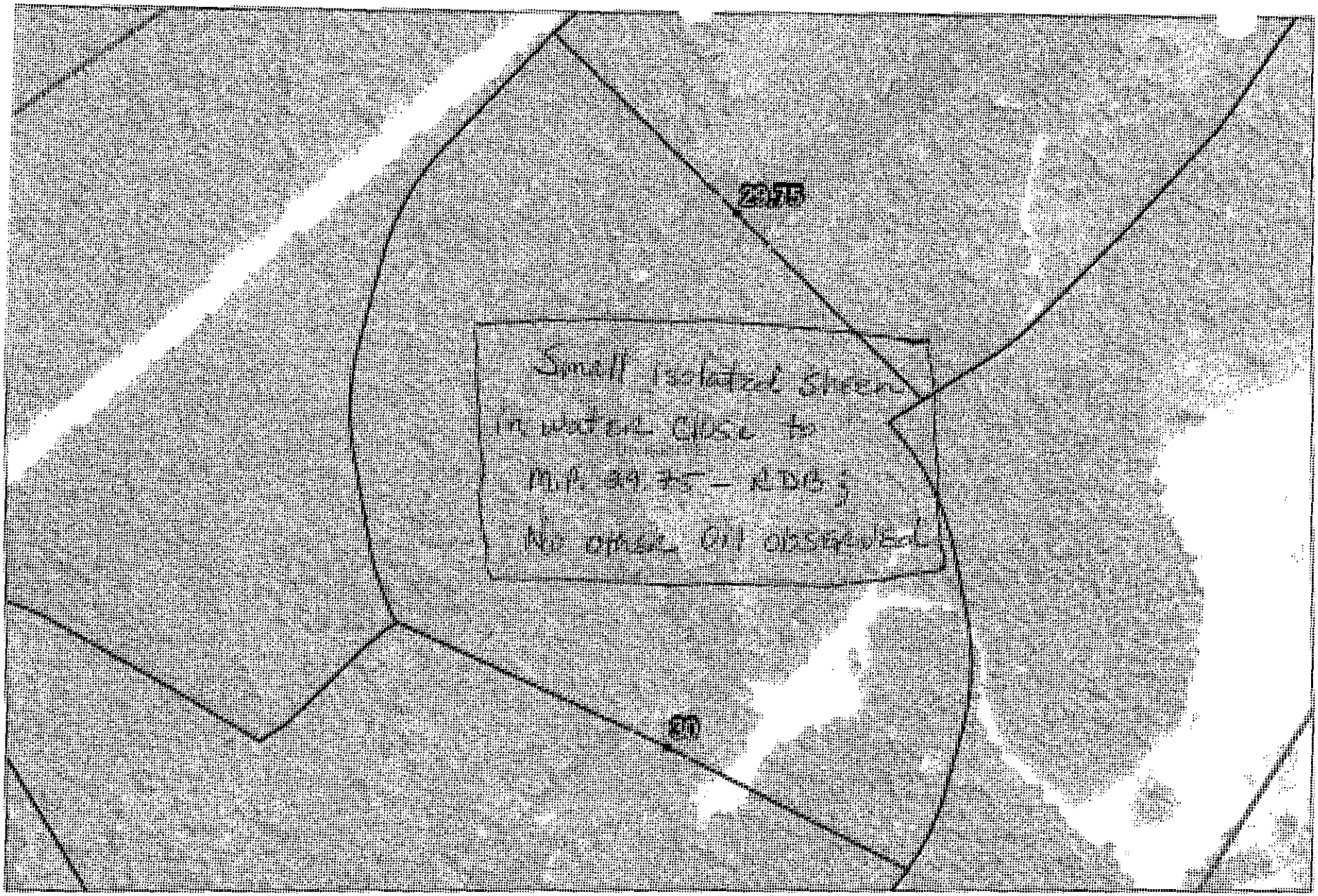
0 75 150 Feet

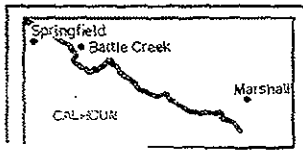
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

Team 3 @ 9/2/10
35.5 to 35.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor):

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From**_____ **Start MP to End MP**_____ **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 29.75 **to MP** 30.0 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

9-1-10 Enbridge
Signature CHRISTOPHER HAUK (date)

1 Sept '10 EPA
Signature MJ MALIPIANSKI (date)

4. **SCAT Reassessment**

Pamela E. Rice 9-5-10 Enbridge
Signature Pamela E. Rice (date)

Kathleen M. Foley 09-05-10 EPA
Signature Kathleen M. Foley (date)

9/5/2010 MDNRE
Signature Christopher Clampitt (date)

Glenn VandeWater 9/5/10
Glenn VandeWater

Michelle Kerr
MICHELLE KERR 09.05.10

Ernie Sarkipato
9/8/10

5. **EPA**

9/14/10 EPA Division Supervisor
Signature (date)

Appendix E
Photos

Field Photo Log – Segment MP 30.00



Photo 0201 – Looking southeast at left descending bank. Near EPA-E-0018.

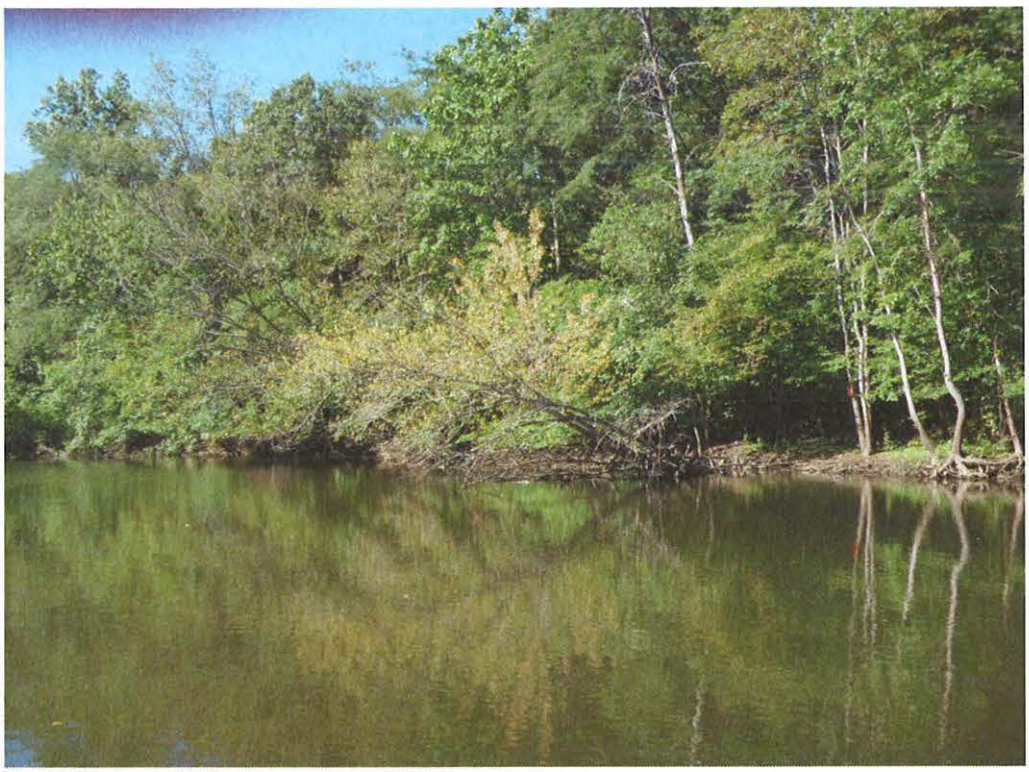


Photo 0202– Looking southwest at right descending bank.



Photo 0203 – Looking southwest at left descending bank.



Photo 0204 – Looking south at right descending bank.



Photo 0205 – Looking northeast at left descending bank.



Photo 0206 – Looking southeast at left descending bank.

Field Photo Log – Segment MP 30.00

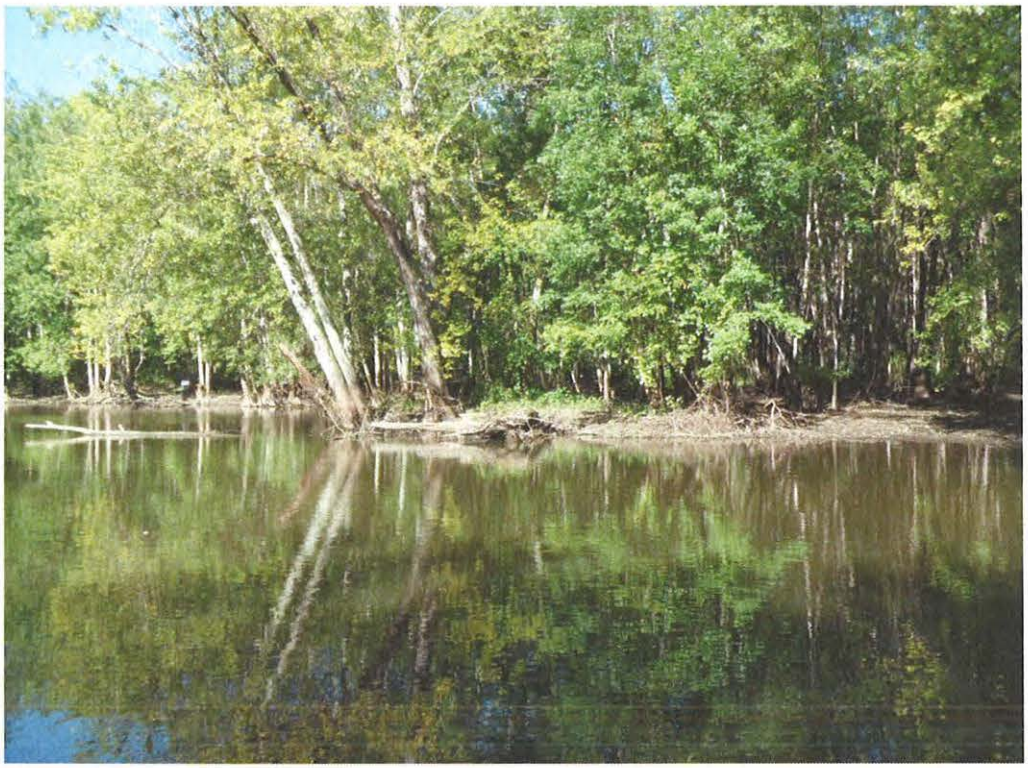


Photo 0207 – Looking southeast at left descending bank. Near SCE2-3, EPA-E-0017, and EPA-E-0019.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 30.25 – MP 30.0 to 30.25

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 30.25 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank area, based on the SCAT assessment, contained one area of oil on the right descending bank . Islands were not present. There were no problematic areas that required special considerations.

Actions

The light oil on the over bank occurred on a soil substrate, and the SCAT recommendation is to leave the oiled soil in place. As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations:

Outcome

Some oiling was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled sediment on the floodplain of right descending bank.

Segment 30.25 has reached the operational endpoints pursuant to the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
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    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

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  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

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FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

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SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
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SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 3.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

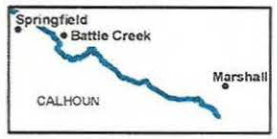
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 30.0-30.25 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 30-30.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

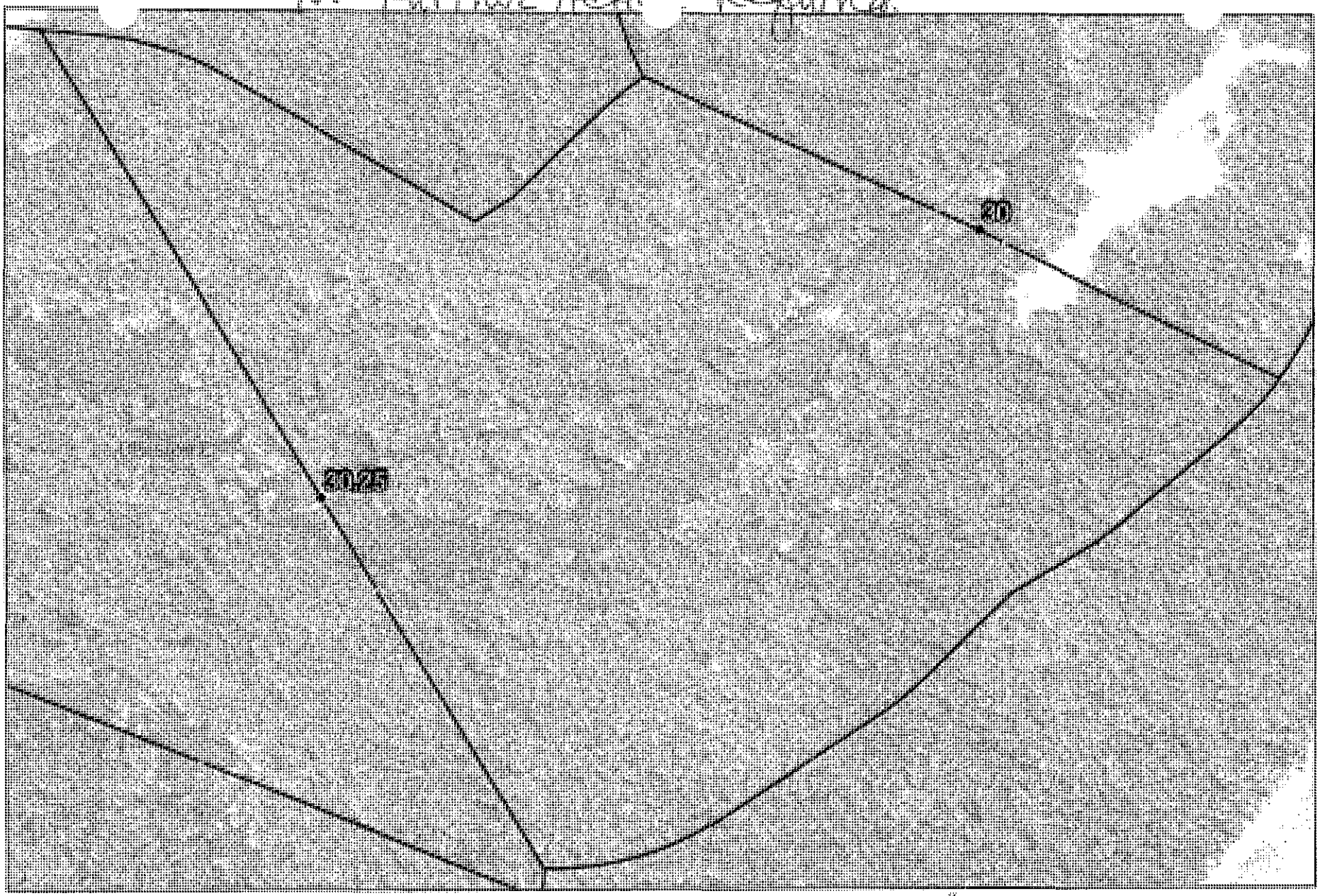
Source: Aerial Photography: USDA, 2009.

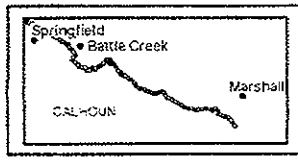
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

No Further Action Required





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

TEAM 1
9/2/10

* NO OIL *

35.5 to 35.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

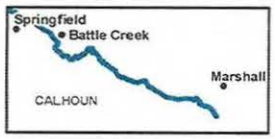
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In.. ..nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 30.0-30.25 Right Bank While Looking Downstream										
EPA-C-0674	Shoreline	SCAT T3 09/02/2010	Sandbar found with oil film and surface oil residue. No cleanup recommendations.					No cleanup recommendations.	42.32361	-85.36188
EPA-C-0675	Overbank	SCAT T3 09/02/2010	Part of Zone B extends into segement 30.5. Zone B consits of sporadic areas of film within the floodplain. Refer to hand drawn map to see shape of Zone. Sheen observed throughout meandering channels-no cleanup recs					No cleanup recommendations.	42.32351	-85.36249





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 30-30.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

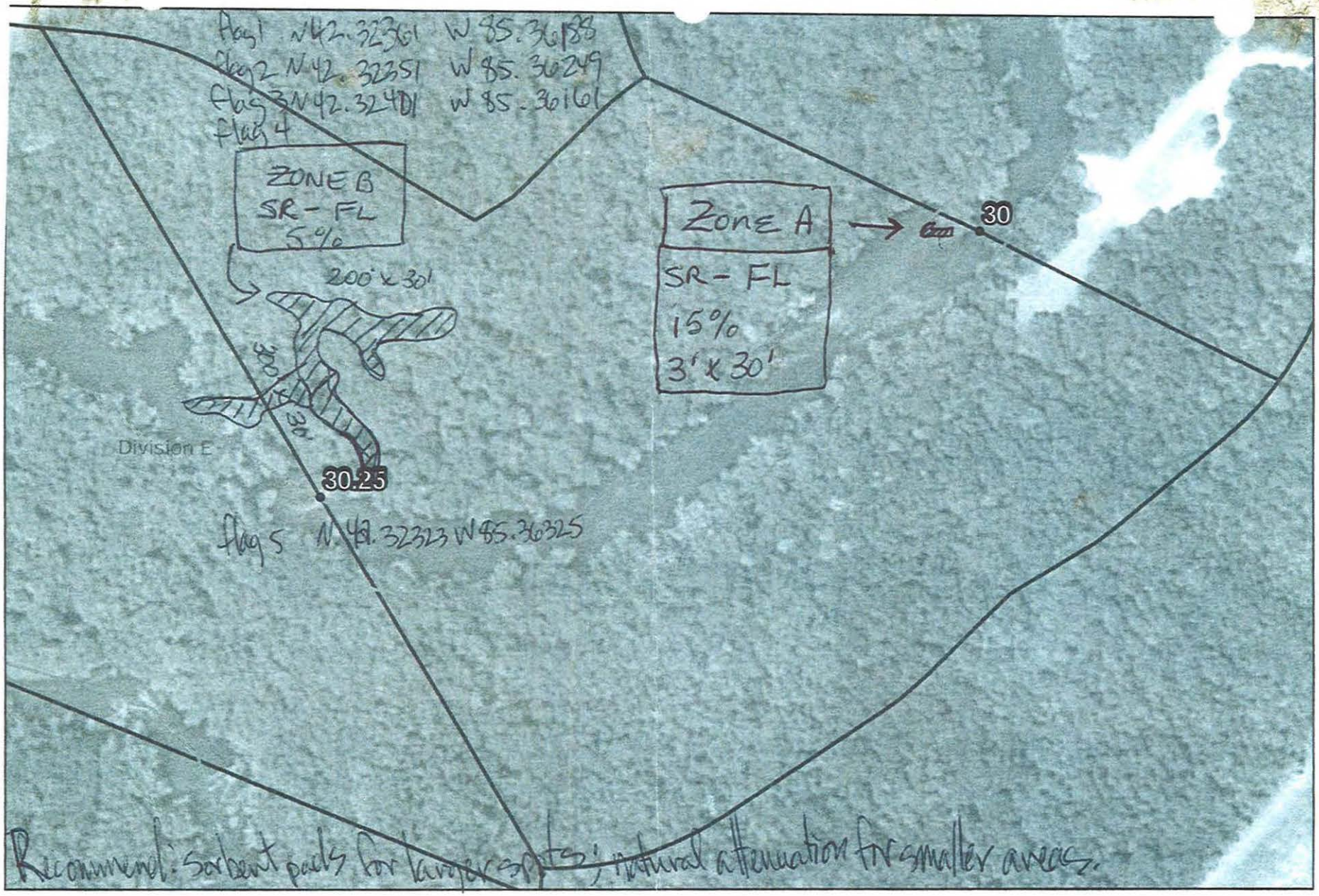
0 75 150 Feet

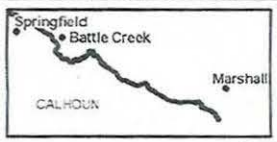
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

Teams 3 & 9 9/2/10 AM
35.5 to 35.75 9/3/10

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 30.0 **to MP** 30.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK	9/10/10 (date)	Enbridge
Signature	9/10/10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Loan	9/11/10 (date)	Enbridge
Signature HOWARD PHAM	9/11/10 (date)	EPA
Signature Chris Conn	9/11/10 (date)	MDNRE

5. **EPA**

Signature	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 30.25



Photo 0208 – Looking northwest at right descending bank. Near EPA-E-0020/Zone A



Photo 0209 – Looking south at left descending bank.

Field Photo Log – Segment MP 30.25

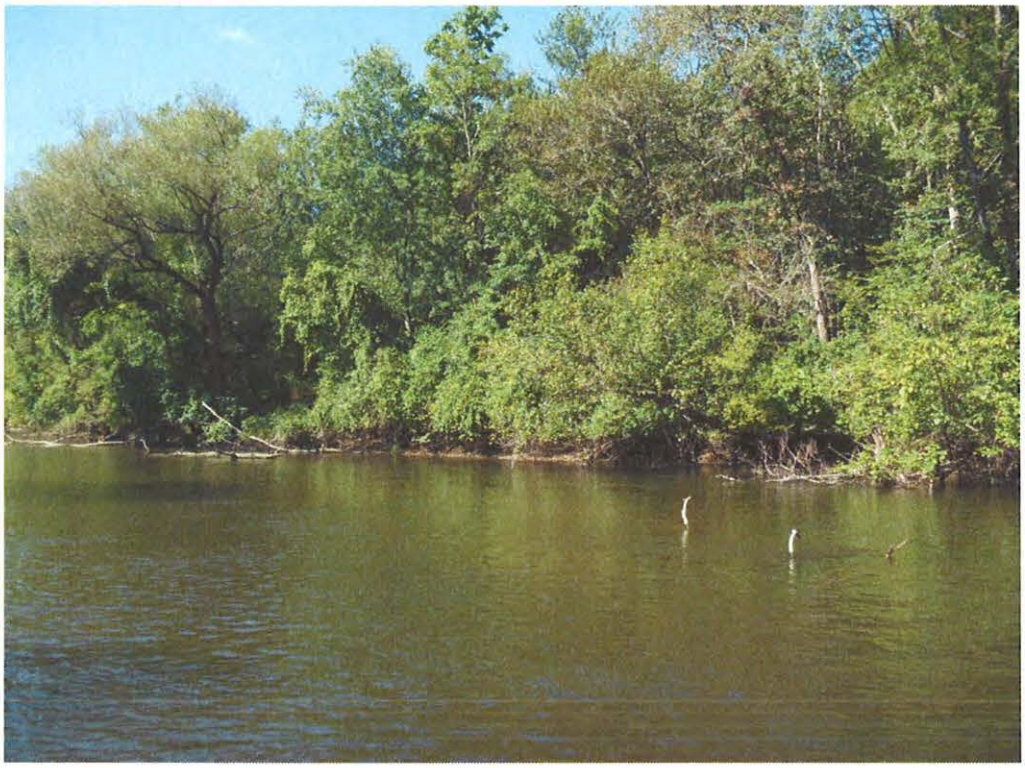


Photo 0210 – Looking southwest at right descending bank.



Photo 0211 – Looking southwest at left descending bank.

Field Photo Log – Segment MP 30.25



Photo 0212 – Looking northwest at right descending bank.



Photo 0213 – Looking northwest at river overbank; Zone B.



Photo 0214 – Looking northwest at river overbank; Zone B.



Photo 0215 – Looking east at river overbank. Near EPA-C-0674/Zone A.



Photo 0216 – Looking west at river overbank. Near EPA-C-0674/Zone A.



Photo 0217 – Looking north at river overbank. Near EPA-C-0675/Zone A.

Field Photo Log – Segment MP 30.25



Photo 0218 – Looking west at river overbank. Near EPA-C-0675/Zone A.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 30.50 – MP 30.25 to 30.50

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 30.50 had no oiling on the left descending bank and tarred vegetation, tarred woody debris and oiled film on the mud shoreline of the right descending bank. The overbank contained no areas requiring clean-up and no islands were present.

Actions

The shoreline clean-up activities within Segment 30.50 consisted of the following:

- Removal of woody vegetation less than 2" in diameter;
- Removal of oiled vegetation leaving roots intact;
- Removal of overhanging limbs.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 30.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Doeumentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**

Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

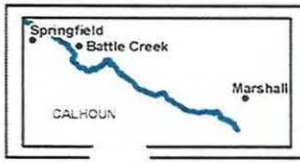
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 30.25-30.5 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

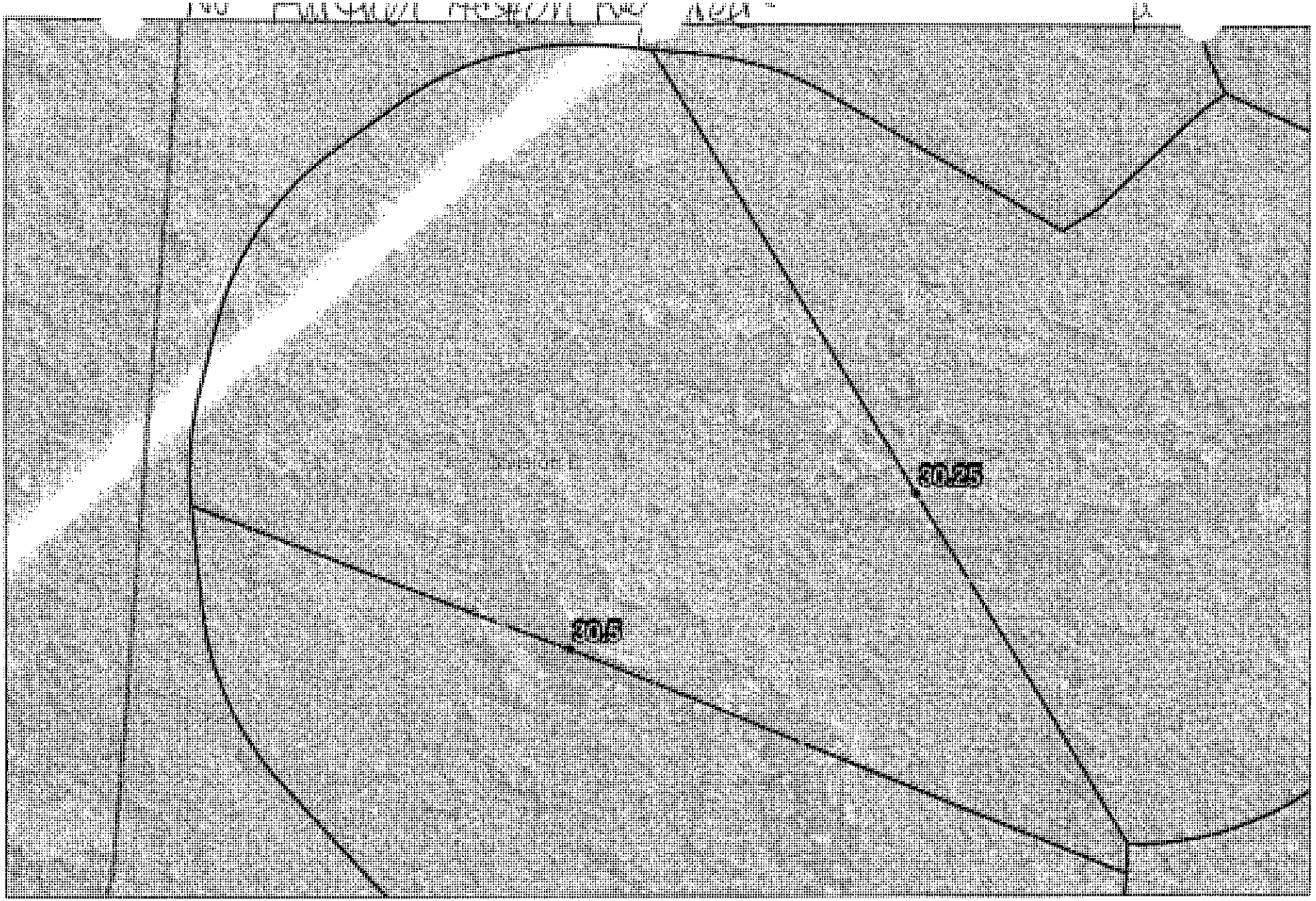
Division E: Mile Marker 30.25-30.5
Left Bank While Looking Downstream

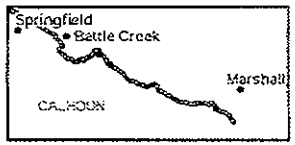
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Mi[illegible] South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

TEAM 1
9/2/10

NO OIL

35.5 to 35.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

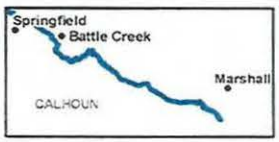
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 30.25-30.5 Right Bank While Looking Downstream										
EPA-C-0676	Shoreline	SCAT T3 09/02/2010	Film of oil on mud shoreline. Refer to red flag 1.						42.3236	-85.36375
EPA-C-0677	Shoreline	SCAT T3 09/02/2010	Zone B consists of Tarred vegetation and woody debris. Refer to red flag 2 in the field.						42.32320	-85.36524





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 30.25-30.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

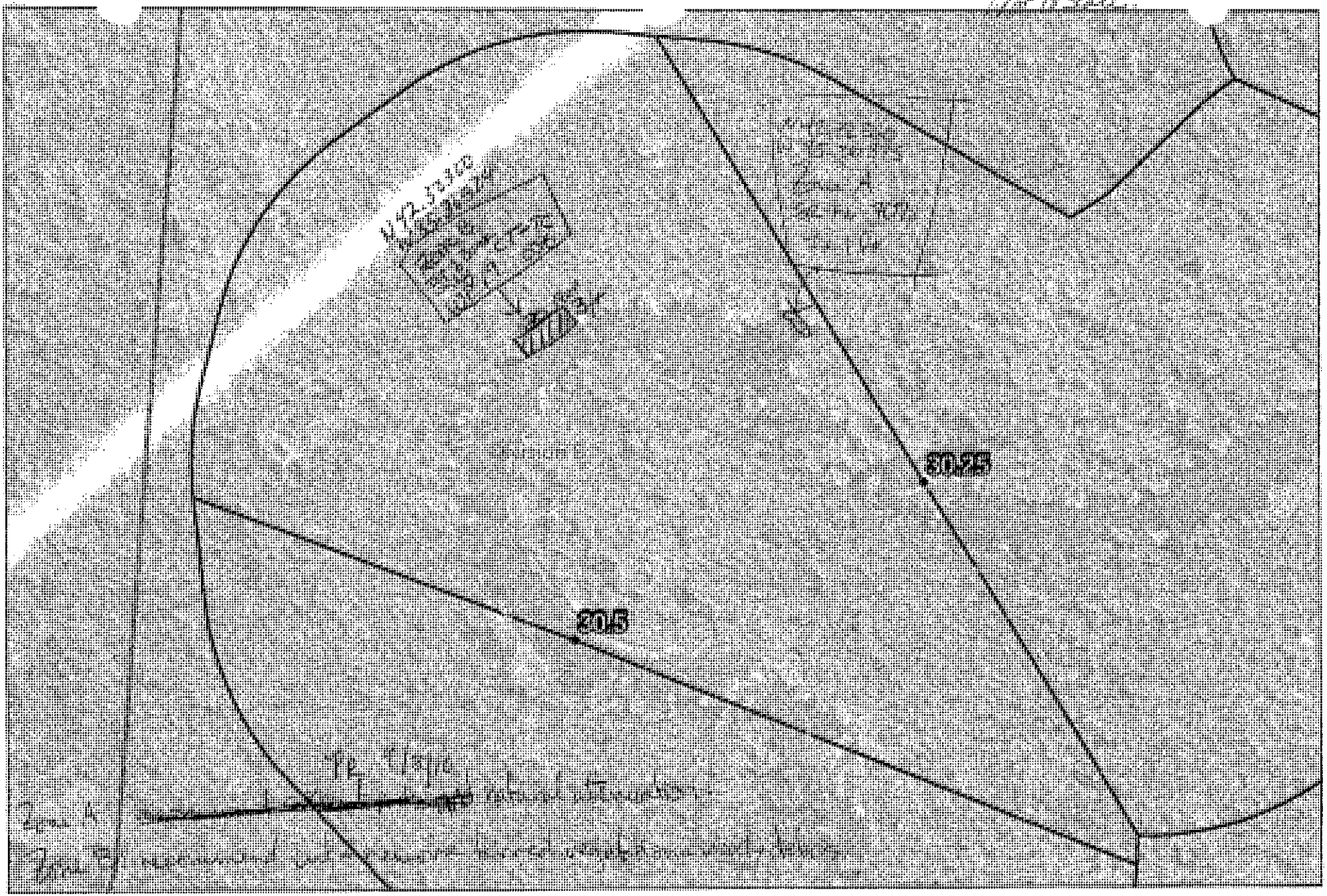
0 75 150 Feet

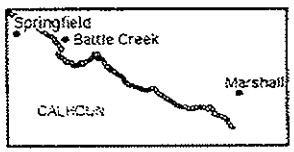
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

Team 3 09/03/10

35.5 to 35.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: Sept. 13. 2010 Time: AM / PM

Operations Division: E Segment ID: From 30.25 Start MP to End MP 30.5 Segment Length: 0.25 mile

Bank: (LDB) / RDB ☐ Island Overbank (LOB)/ROB

Weather: (Sun)/Cloud/Rain/Snow/ 60°

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

3 Ft x 30 Ft Area — Veg Clean up Completed

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Veg clean up Completed

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

N/A

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

N/A

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)

Date: 9-13-10 **Time: AM / PM**

Operations Division: E **Segment ID: From** 30.25 **Start MP to End MP** 30.5 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

[redacted]

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

After reviewing the SCAT the RDB required no action, LDB requires [redacted] Vegetation removal in Zone B (30'x3') area.

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Inspected this Segment and all clean up is complete according to the SCAT recommendations.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 30.25 to 30.50 Left Bank While Looking Downstream										
			No operational focus areas identified							(Y) N

Printed Team Members Names: Mike Van Loan, Chris Claypitt, Amanda Pham

Date: 7/14/10

Comments:

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 30.25 to 30.50 Right Bank While Looking Downstream										
EPA-C-0676	Shoreline	SCAT T3 09/0202010	Film of oil on mud shoreline					42.32360	-85.36375	(Y) N
EPA-C-0677	Shoreline	SCAT T3 09/0202010	Zone B consist of tarred vegetation and woody debris				Remove debris	42.32320	-85.36524	(Y) N

Printed Team Members Names: Mike Van Loan, Chris Clampitt, Howard Pham

Date: 7/14/10

Comments:

Sheen/small tar balls (ø 1mm) on water surface near shore. Appears to be from sediment. Boom in place. Used absorbent pads to soak up the balls.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ **Segment ID: From** 30.25 **Start MP to End MP** 30.5 **Segment Length: 0.25 mile**

Re 1. **SCAT** ☒

2. **Clean up** ☐

3. **Inspection**

Signature (date) Enbridge

Signature (date) EPA

4. **SCAT Reassessment**

Signature Richard Von Loon 9/14/10 (date) Enbridge

Signature 9/14/10 (date) EPA

Signature 9/14/10 (date) MDNRE

5. **EPA**

Signature Gary Gibson 9/20/10 (date) EPA Division Supervisor

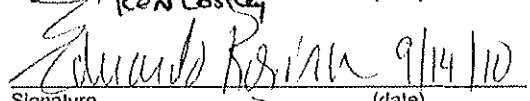
Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 30.25 to MP 30.50 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**



14-Sept-2010 Enbridge
Signature Ken Costley (date)



9/14/10 EPA
Signature Eduardo Rovira (date)

4. **SCAT Reassessment**

_____ Enbridge
Signature (date)

_____ EPA
Signature (date)

_____ MDNRE
Signature (date)

5. EPA

_____ EPA Division Supervisor
Signature (date)

Appendix E
Photographs



Photo 0540 – Looking northwest at right descending bank.



Photo 0541 – Looking southwest at left descending bank.



Photo 0542 – Looking west at left descending bank.



Photo 0543 – Looking north at right descending bank.



Photo 0544 – Looking west at left descending bank.



Photo 0545 – Looking northeast at right descending bank, near EPA-C-0676.



Photo 0546 – Looking north at right descending bank, near EPA-C-0676.



Photo 0547 – Looking northwest at right descending bank, near EPA-C-0676.



Photo 0548 – Looking southwest at left descending bank.



Photo 0549 – Looking west at right descending bank, near EPA-C-0677.



Photo 0550 – Looking northwest at right descending bank, near EPA-C-0677.



Photo 0551 – Looking south at left descending bank.



Photo 0552 – Looking southwest at right descending bank.



Photo 0553 – Looking south at left descending bank.



Photo 0554 – Looking southwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 30.75 – MP 30.50 to 30.75

Enbridge Energy

September 18, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 30.75 had no oiling on the left descending bank. No islands were present in this river segment. No oiling was observed along the right descending bank with the exception of oiling in an alcove. The overbank areas contained a mudflat and drainage way on the right overbank with oily film . There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

Oil in some areas was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled soil along right descending bank and in the overbank within SCAT Zone A remains.

Segment 30.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

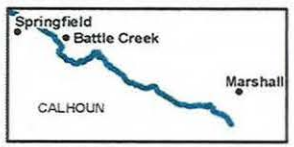
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 30.5-30.75 Left Bank While Looking Downstream										
EPA-E-0022	Shoreline	SCAT T1 8/19/2010	Film released from sediments along the Shoreline						42.32018	-85.36383





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 30.5-30.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

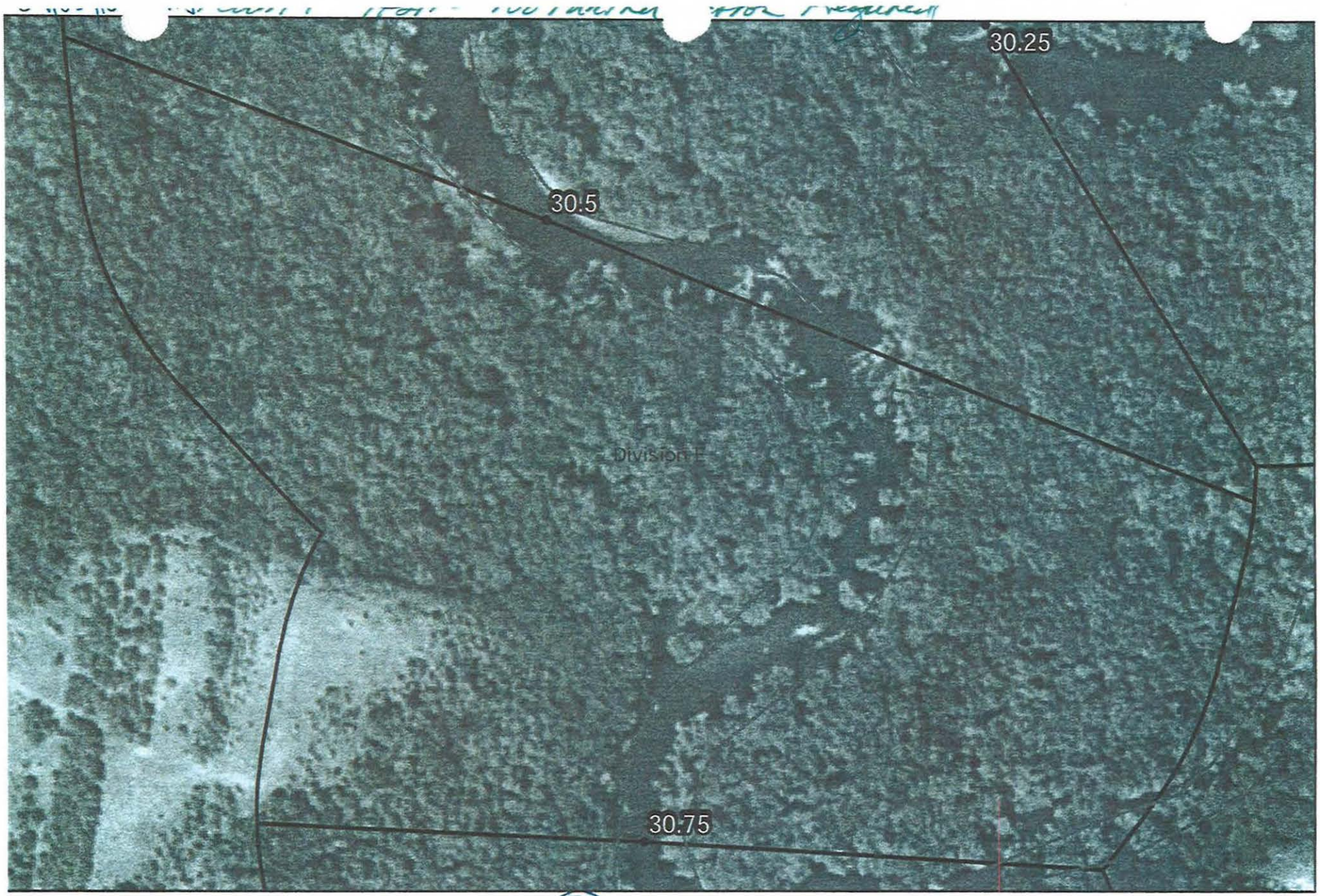
0 75 150 Feet

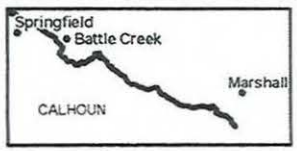
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

NEAR

30.5-30.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

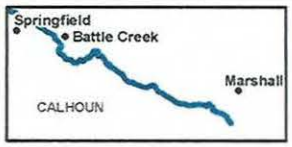
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 30.5-30.75 Right Bank While Looking Downstream										
SCE2-2	Shoreline	Shoreline Assessment	•			•	Mildly oily alcove with mildly oily banks. Remove only top surface of bank - 30 ft to 50 ft. Skim water surface oil with absorbent pads.	Remove only top surface of bank - 30 ft to 50 ft. Skim water surface oil with absorbent pads.	42.320167	-85.36445
EPA-C-0678	Overbank	SCAT T3 09/02/2010	Zone A consists of a floodplain channel mudflat with an oily film on mud. Natural Attenuation is recommended. This zone was flagged with three red flags.					Natural Attenuation is recommended.	42.32056	-85.36407
EPA-E-0021	Main Channel	SCAT T1 8/19/2010	WP-182 - A boom has been placed and is keeping the sheen/film along the Shoreline in the pool						42.32017	-85.36367





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 30.5-30.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

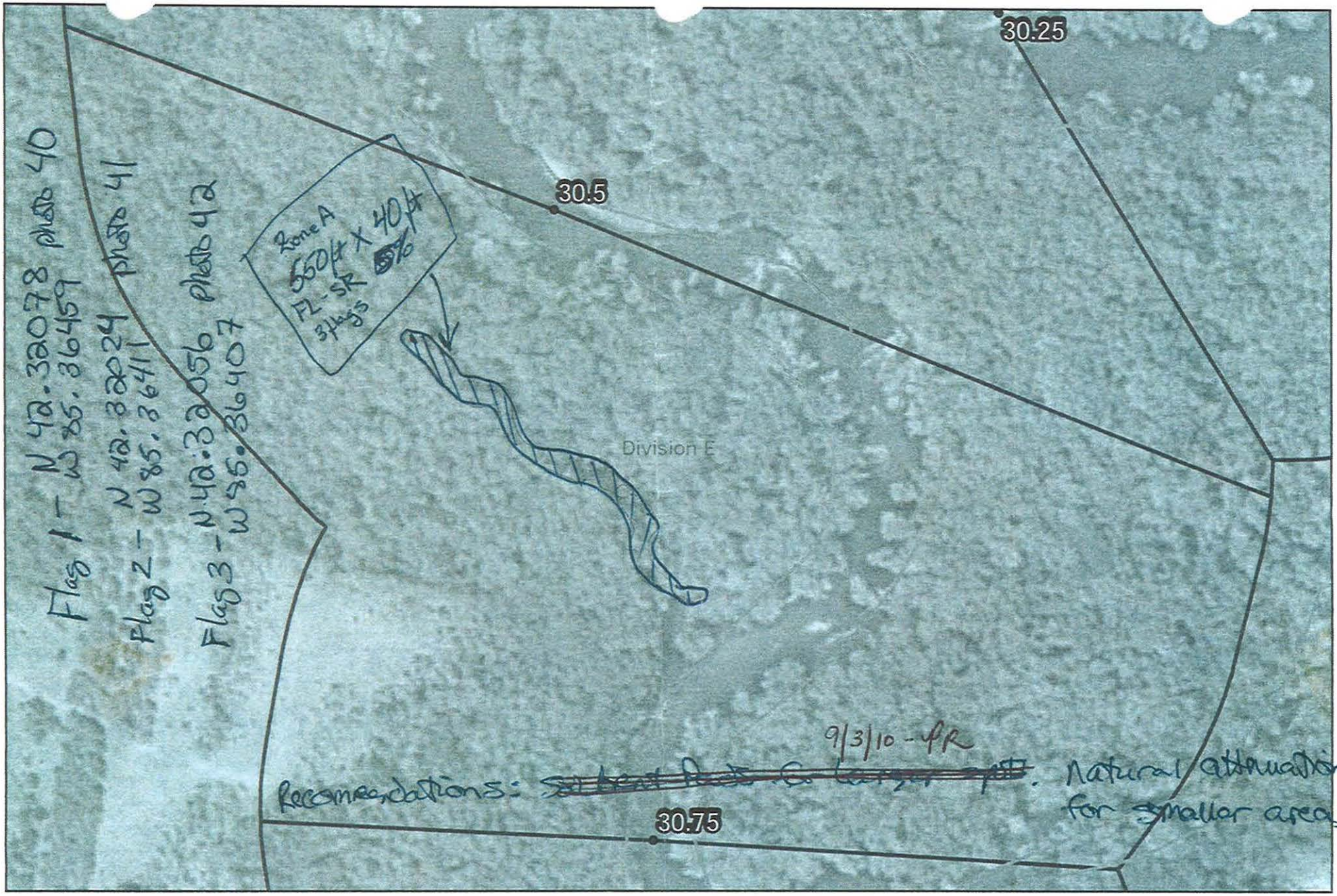
0 75 150 Feet

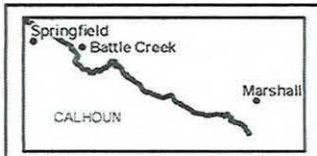
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

Team 3 9-3-2010
35.5 to 35.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 09-01-10 Time: AM / PM

Operations Division: E Segment ID: From 30.5 Start MP to End MP 30.75 Segment Length: 0.25 mile

Bank: LDB / (RDB) ☐ Island Overbank: (LOB)/ROB

Weather: (Sun)/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): Steve Turner ACC Concrete

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recommendations

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

No Recommendations

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-1-10 **Time: AM / PM**

Operations Division: E **Segment ID: From** 30.5 **Start MP to End MP** 30.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

After reviewing the SCAT report the LDB was a litter releasing down the Sediment and the RDB required no action.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected this segment and is Cleaned up according to the SCAT recommendations and EPA-E-0022 may require O+M at later date

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 30.5 **to MP** 30.75 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER MAUK	9-1-10 (date)	Enbridge
Signature M J NALIPINSKI	1 Sept '10 (date)	EPA

4. **SCAT Reassessment**

Signature Glenn Vandelinder	9/7/10 (date)	Enbridge	Pamela E. Rice 9/7/10 Pamela E. Rice
Signature MICHELLE KERR	09.07.10 (date)	EPA	Kathleen Foley 9/7/10 Kathleen Foley
Signature	9/7/10 (date)	MDNRE	9/8/10

5. **EPA**

Signature GARY LYSON	9/19/10 (date)	EPA Division Supervisor

Appendix E
Photographs



Photo 0227 – Looking southeast at left descending bank.



Photo 0228 – Looking south at right descending bank.

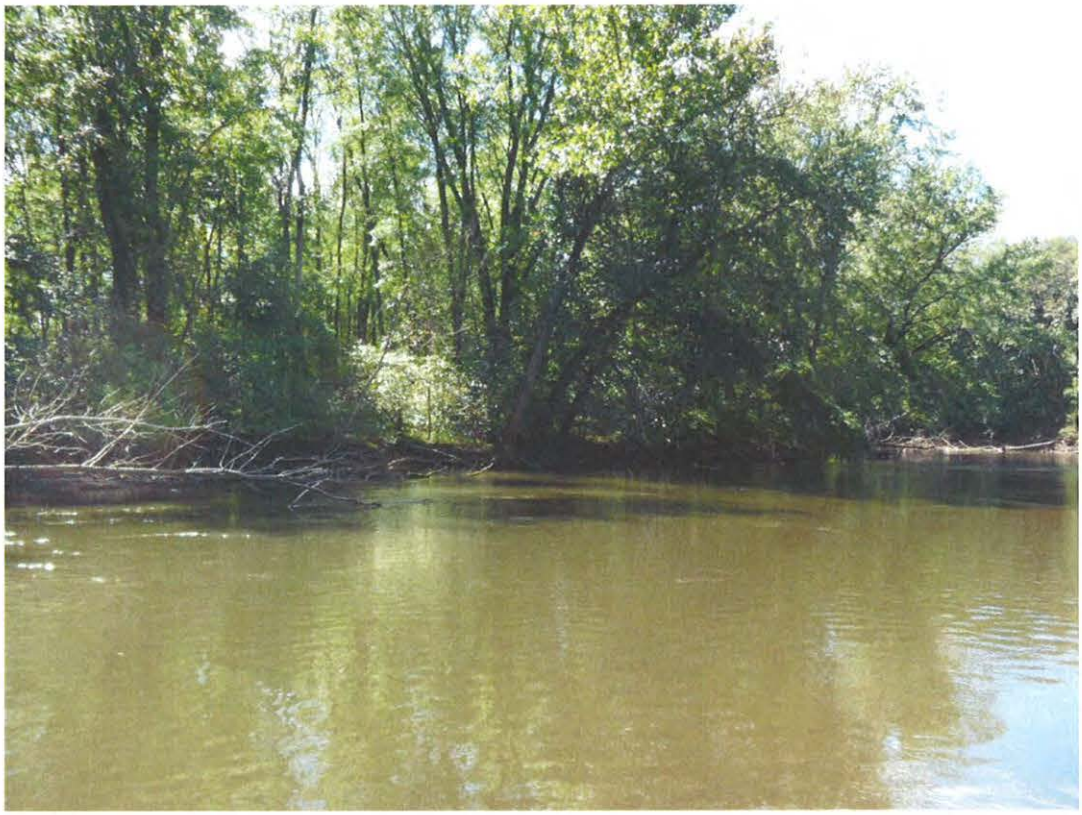


Photo 0229 – Looking south at left descending bank.

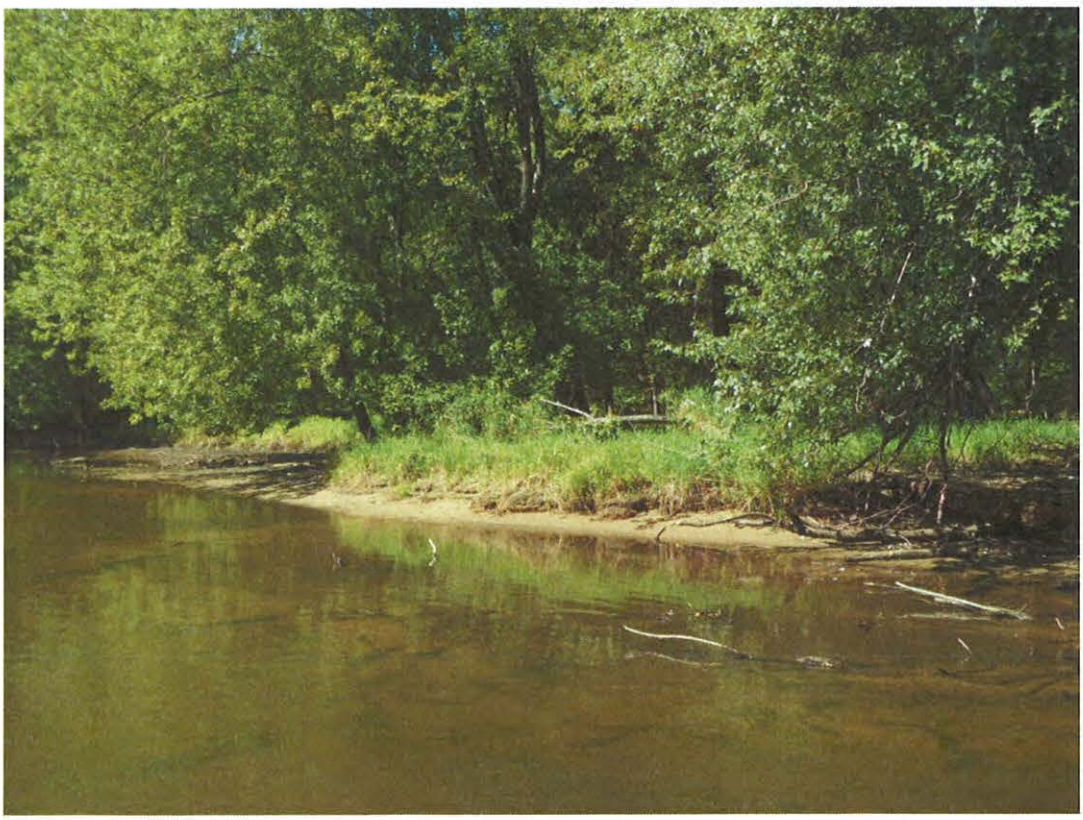


Photo 0230 – Looking southwest at right descending bank.



Photo 0231 – Looking north at right descending bank, near SCE2-2.



Photo 0232 – Looking northwest at right overbank, near EPA-C-0678 and Zone A.



Photo 0233 – Looking southeast at right overbank, near EPA-C-0678 and Zone A.



Photo 0234 – Looking southeast at right overbank, near EPA-C-0678 and Zone A.



Photo 0235 – Looking northwest at right overbank, near EPA-C-0678 and Zone A.



Photo 0236 – Looking east at left descending bank, near EPA-E-0021 and EPA-E-0022.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 31.00 – MP 30.75 to 31.00

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 31.00 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 31.00 has reached operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 30.75-31.0 Left Bank While Looking Downstream										
SCE2-7	Shoreline	Shoreline Assessment	•		•		Sheen and boom.		42.31702	-85.36535





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 30.75-31
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

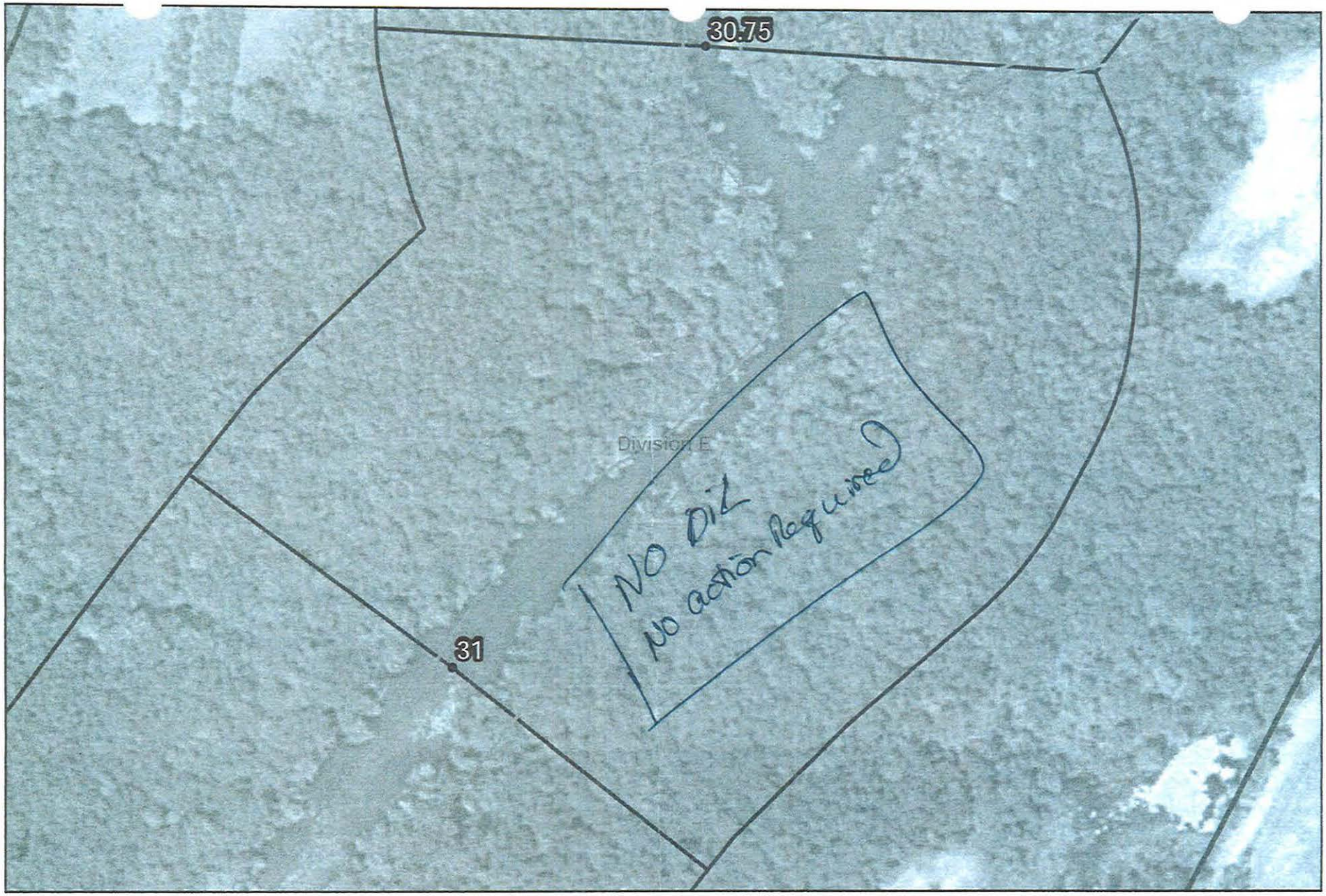
0 75 150
Feet

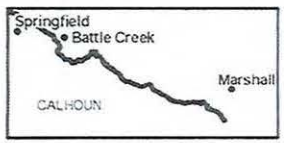
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

Team 3 9-3-2010

35.5 to 35.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In[illegible]nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 30.75-31.0 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 30.75-31
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

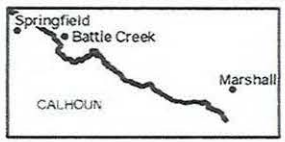
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TEAM 4/3/10 No further action required





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

NFAR

30.75-31

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION **Operations Division:** E **Segment ID: From MP** 30.75 **to MP** 31.0 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

[signature] 9-1-10 Enbridge
Signature CHRISTOPHER HAUK (date)

[signature] 1 Sept '10 EPA
Signature (date)
M J NALIPANSKI

4. **SCAT Reassessment**

Pamela E. Rice 9-5-10 Enbridge Glenn Vande Water 9/5/10
Signature (date) Glenn Vande Water
Pamela E. RICE

Kathleen M. Foley 09-05-10 EPA Michelle Kerr
Signature (date) MICHELLE KERR 09.05.10
Kathleen M. Foley

[signature] 9-5-2010 MDNRE Chris Kiedkamp 9/7/10
Signature (date)
Rachel Matthews

5. **EPA**

[signature] 9/14/10 EPA Division Supervisor
Signature (date)

Revised 8/29/10

Appendix E
Photos

Field Photo Log – Segment MP 31.00



Photo 0237 – Looking south at right descending bank.

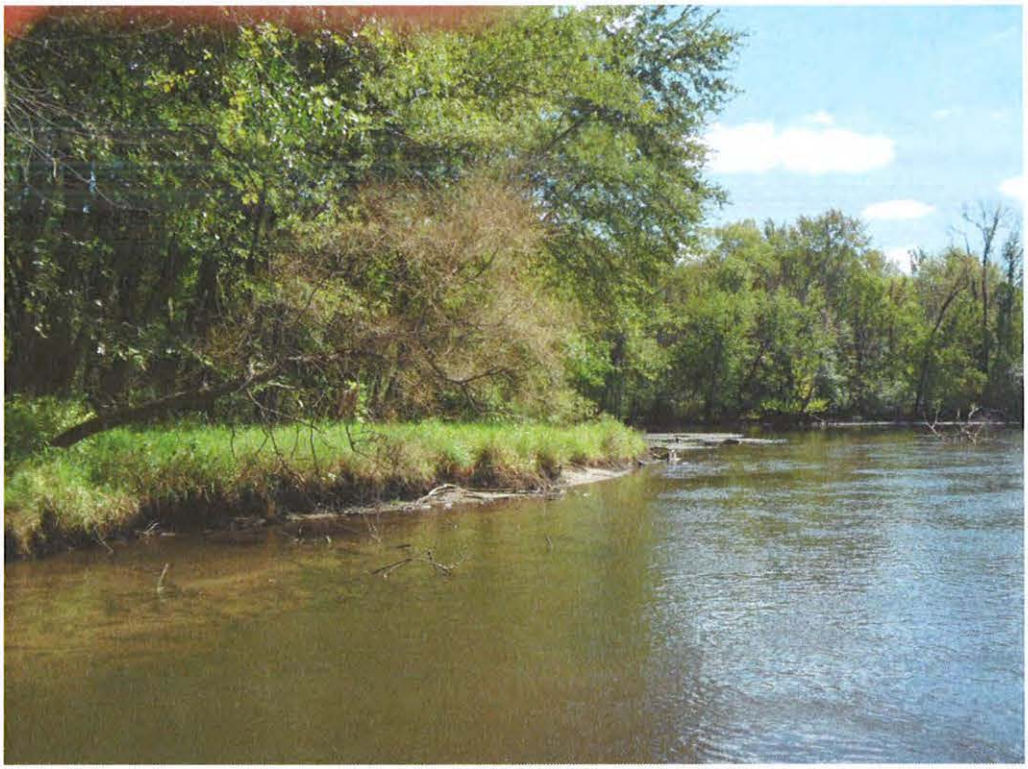


Photo 0238 – Looking southeast at left descending bank.

Field Photo Log – Segment MP 31.00



Photo 0239 – Looking north at left descending bank.



Photo 0240 – Looking east at left descending bank.



Photo 0241 – Looking southwest at right descending bank.



Photo 0242 – Looking south at left descending bank.

Field Photo Log – Segment MP 31.00

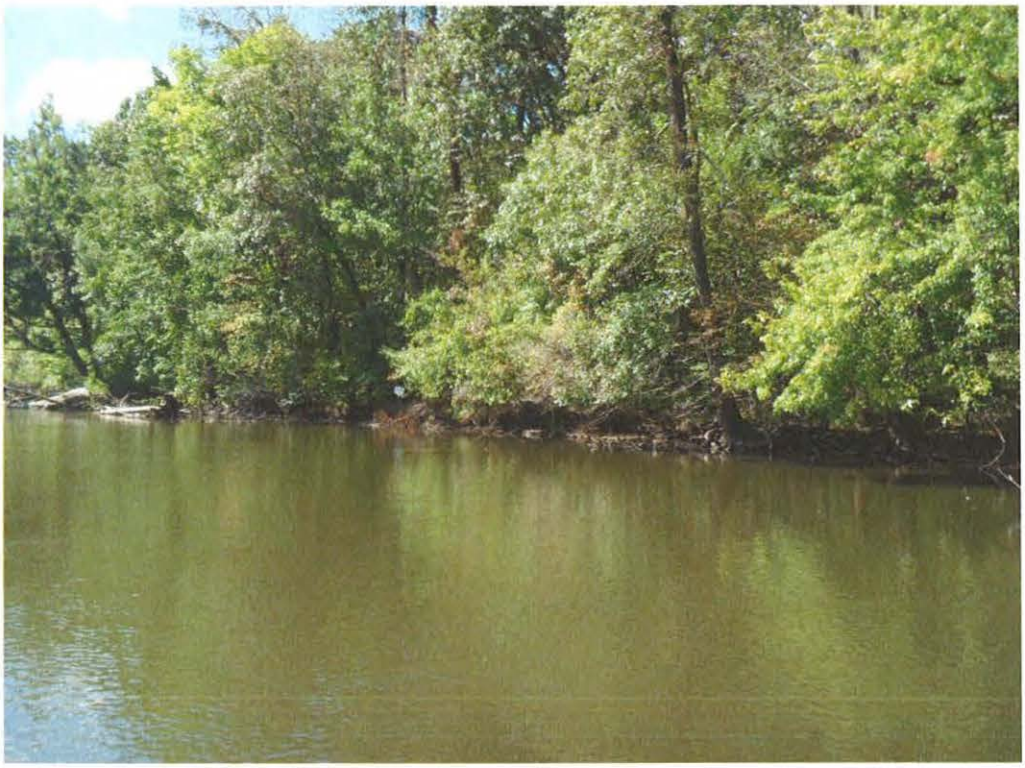


Photo 0243 – Looking west at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 31.25 – MP 31.0 to 31.25

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 31.25 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 31.25 has reached operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
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FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
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PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, inciplent asphalt pavements)
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NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

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PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

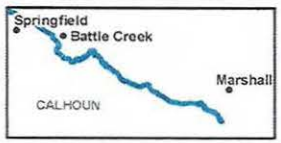
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 31.0-31.25 Left Bank While Looking Downstream										
EPA-E-0024	Main Channel	SCAT T1 8/19/2010	WP 188 - When we got out to check up the trib, more oil was released from the sediments along the Shoreline.						42.31623	-85.36607





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 31-31.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

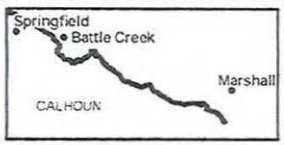
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

7/3/10 [illegible] No Further Action Required





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

NFAR [illegible]

31-31.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

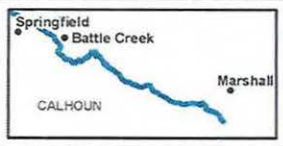
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Ir. nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 31.0-31.25 Right Bank While Looking Downstream										
EPA-E-0023	Main Channel	SCAT T1 8/19/2010	WP 182-183 - no observed oil					No cleanup recommendations.	42.31427	-85.36912





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 31-31.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

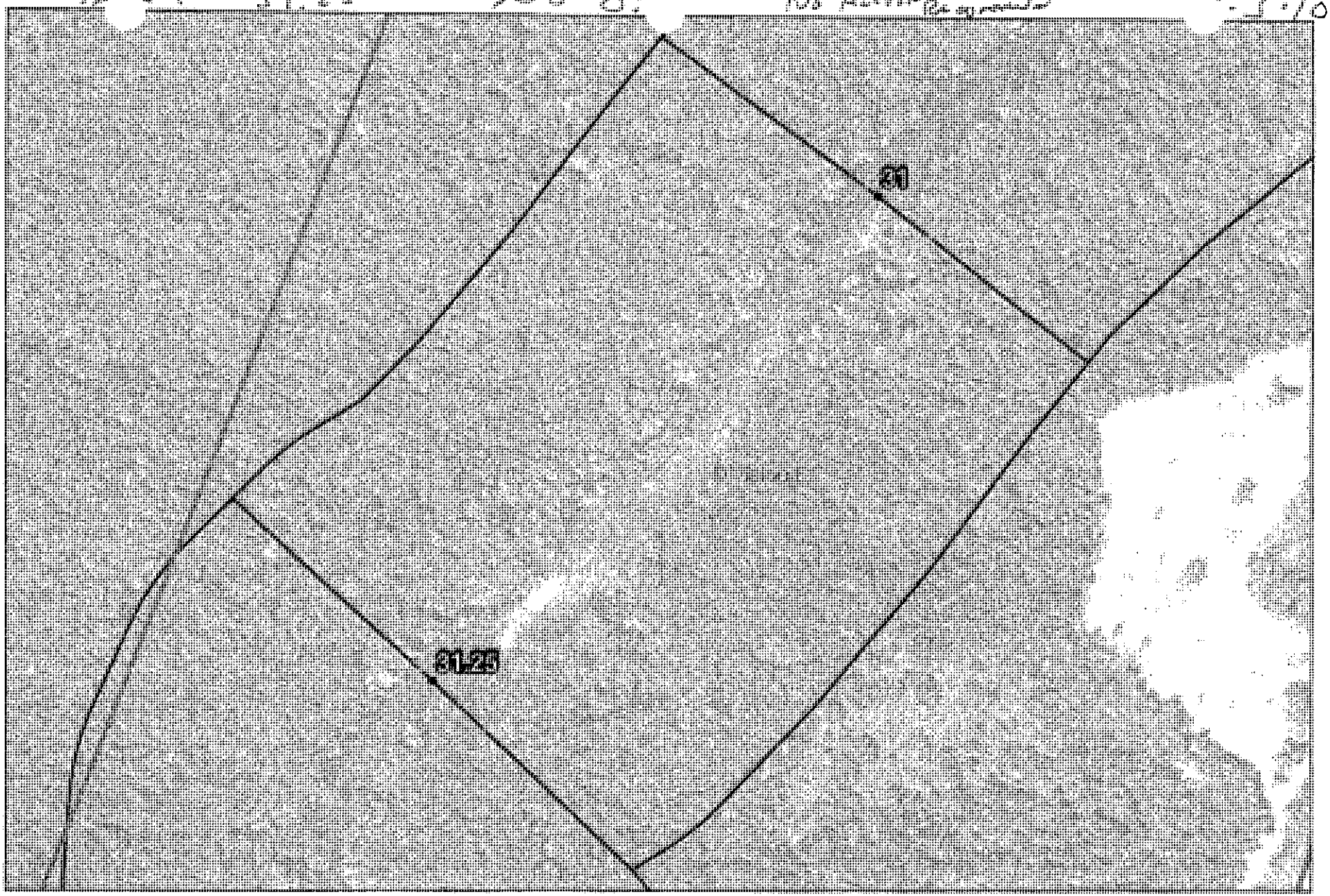
0 75 150
Feet

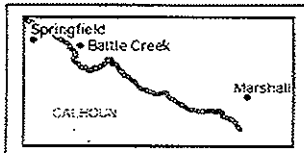
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

31-31.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 31.0 **to MP** 31.25 **Segment Length: 0.25 mile** ?

7

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

[signature] 9-1-10 Enbridge
Signature CHRISTOPHER HANS (date)

MJ Nalipinski 1 Sept '10 EPA
Signature (date)
MJ NALIPINSKI

4. **SCAT Reassessment**

Pamela E. Rice 9-5-10 Enbridge Glenn Vande Water 9/5/10
Signature (date) Glenn Vande Water
Pamela E. RICE

Kathleen M. Foley 09-05-10 EPA Michelle Kerr
Signature (date) MICHELLE KERR 09.05.10
Kathleen M. Foley

[signature] 9-5-2010 MDNRE Chris Velokamp 9/7/10
Signature (date)
Rachel Matthews

5. **EPA**

Diedre Noyd 9/14/10 EPA Division Supervisor
Signature (date)

Appendix E
Photos

Field Photo Log – Segment MP 31.25



Photo 0244 – Looking southeast at left descending bank. Near EPA-E-0024.



Photo 0245 – Looking west at right descending bank.

Field Photo Log – Segment MP 31.25



Photo 0246 – Looking south at left descending bank.



Photo 0247 – Looking west at right descending bank.



Photo 0248 – Looking south at left descending bank.



Photo 0249 – Looking west at right descending bank. Near EPA-E-0023.

Field Photo Log – Segment MP 31.25



Photo 0250 – Looking south at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 31.5 – MP 31.25 to 31.5

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 31.50 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 31.5 has reached operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

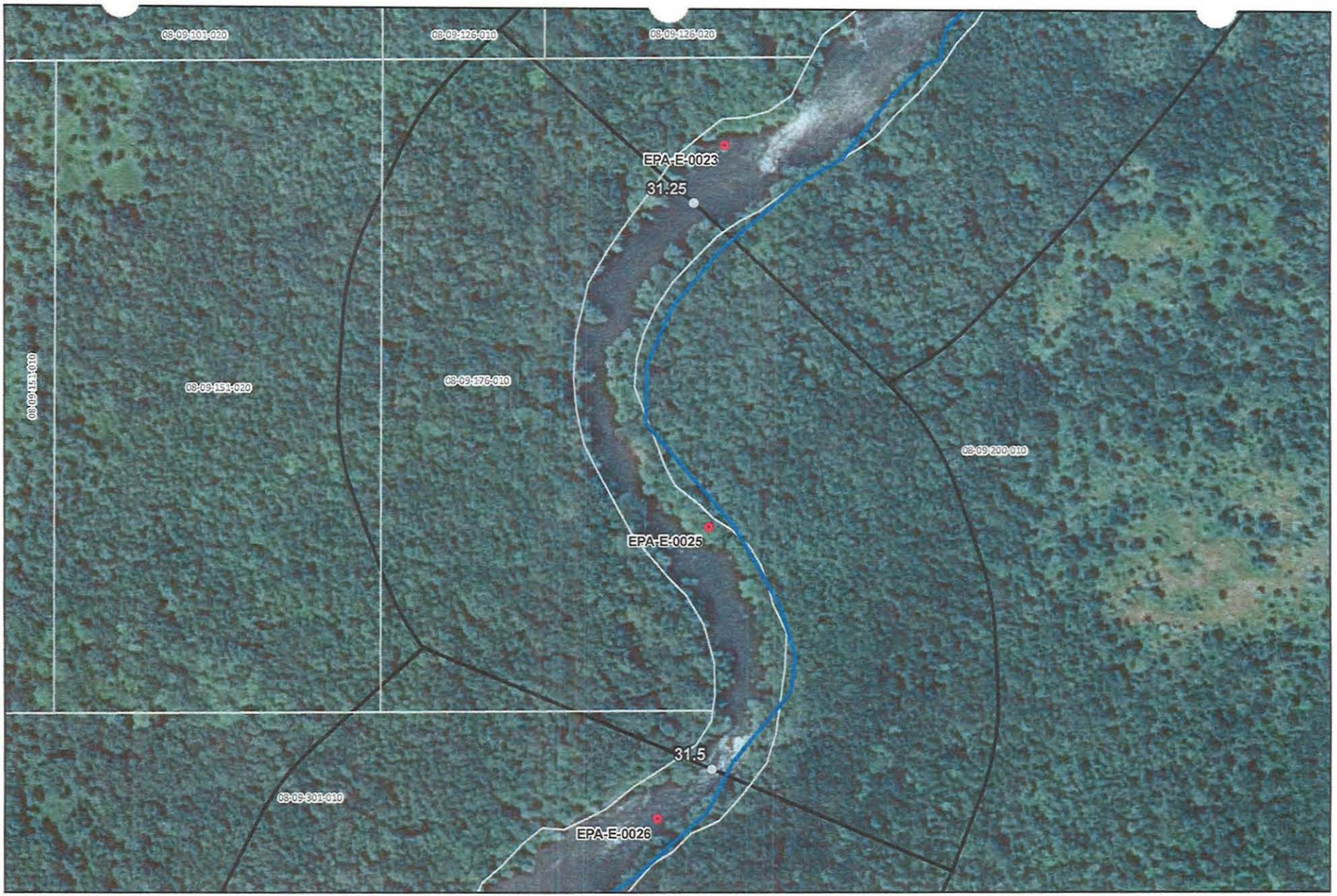
Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

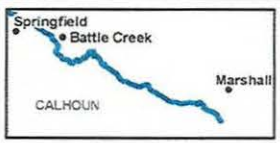
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 31.25-31.5 Left Bank While Looking Downstream										
EPA-E-0025	Main Channel	SCAT T1 8/19/2010	WP-185-186 - no observed oil					No cleanup recommendations.	42.31212	-85.36920





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 31.25-31.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

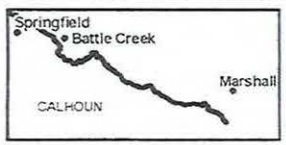
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

1 EHM # 1. 07/05/10 Further Action Required KMT -





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

LDB

NF AR

31.25-31.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

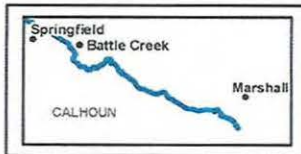
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In... nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 31.25-31.5 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 31.25-31.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

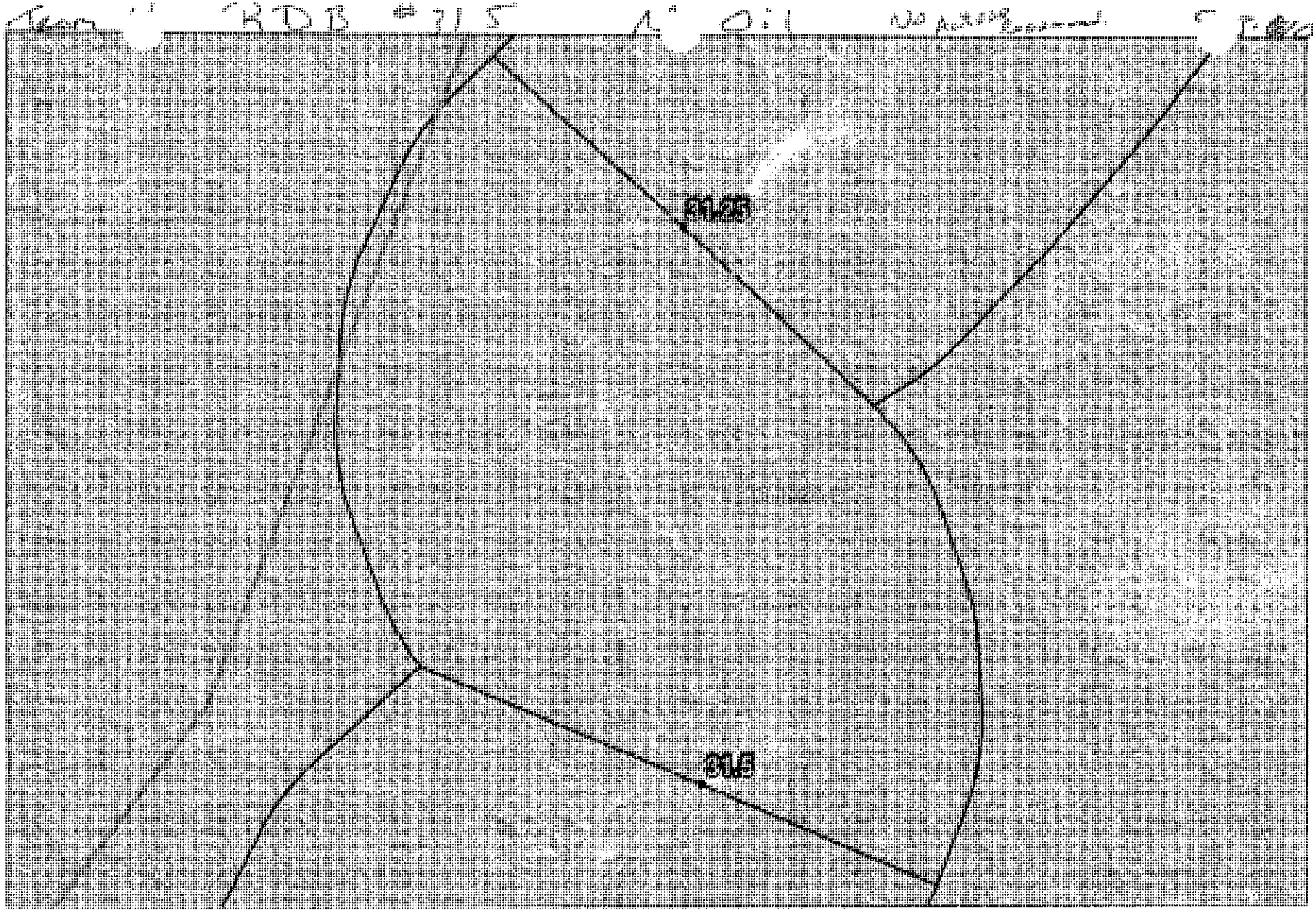
0 75 150
Feet

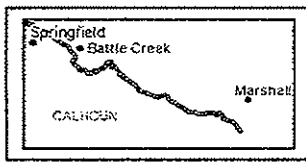
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

31.25-31.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 31.25 **to MP** 31.5 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUS	9-1-10 (date)	Enbridge	
Signature M J NALYSINSKI	1 Sep 10 (date)	EPA	

4. **SCAT Reassessment**

Signature Michael Van Loan	09/05/2010 (date)	Enbridge	Glenn Vande Walle 9/5/10 Glenn Vande Walle
Signature Gary Andrew	9.5.10 (date)	EPA	Kathleen M. Foley Kathleen M. Foley 9-05-10
Signature Kenneth M. Mroczkowski	09/05/2010 (date)	MDNRE	Chris Yeoakamp 9/7/10

5. **EPA**

Signature	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 31.50



Photo 0251 – Looking west at right descending bank.



Photo 0252 – Looking south at left descending bank.

Field Photo Log – Segment MP 31.50



Photo 0253 – Looking southwest at right descending bank.



Photo 0254 – Looking south at left descending bank.

Field Photo Log – Segment MP 31.50



Photo 0255 – Looking east at left descending bank. Near EPA-E-0025.



Photo 0256 – Looking southeast at left descending bank.

Field Photo Log – Segment MP 31.50



Photo 0257 – Looking south at right descending bank.

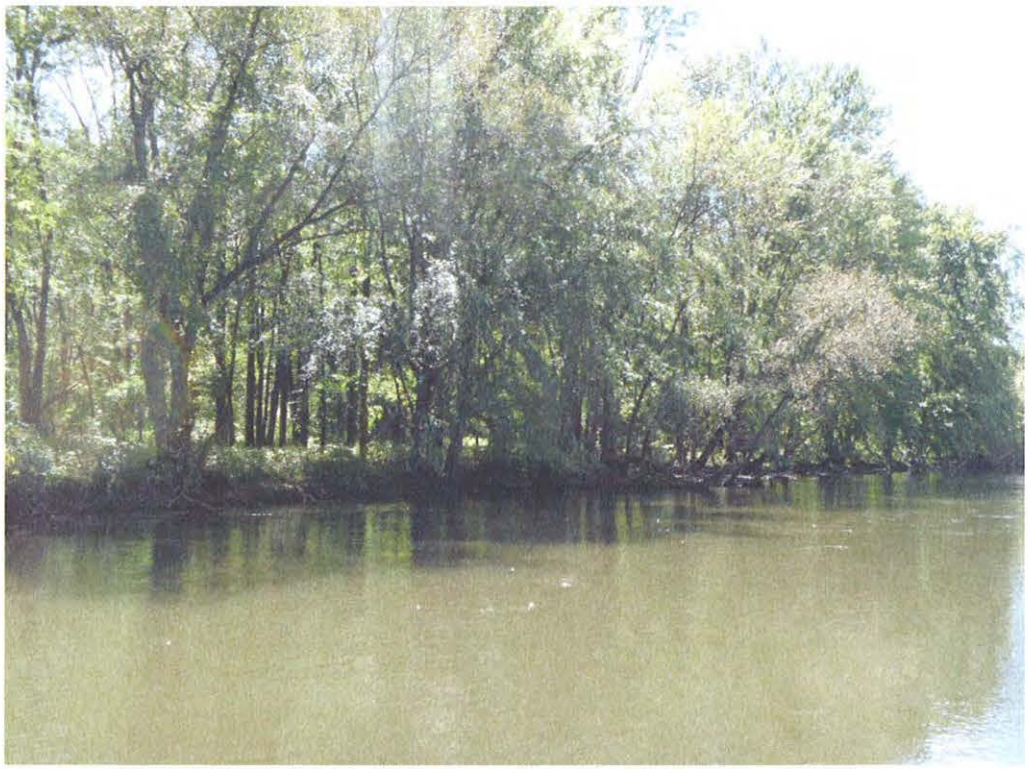


Photo 0258 – Looking south at left descending bank.

Field Photo Log – Segment MP 31.50



Photo 0259 – Looking west at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 31.75 – MP 31.5 to 31.75

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 31.75 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and there was no oiling on the island. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 23.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
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Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
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AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
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SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

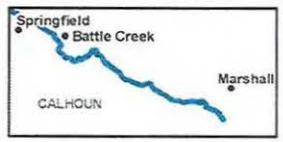
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 31.5-31.75 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 31.5-31.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

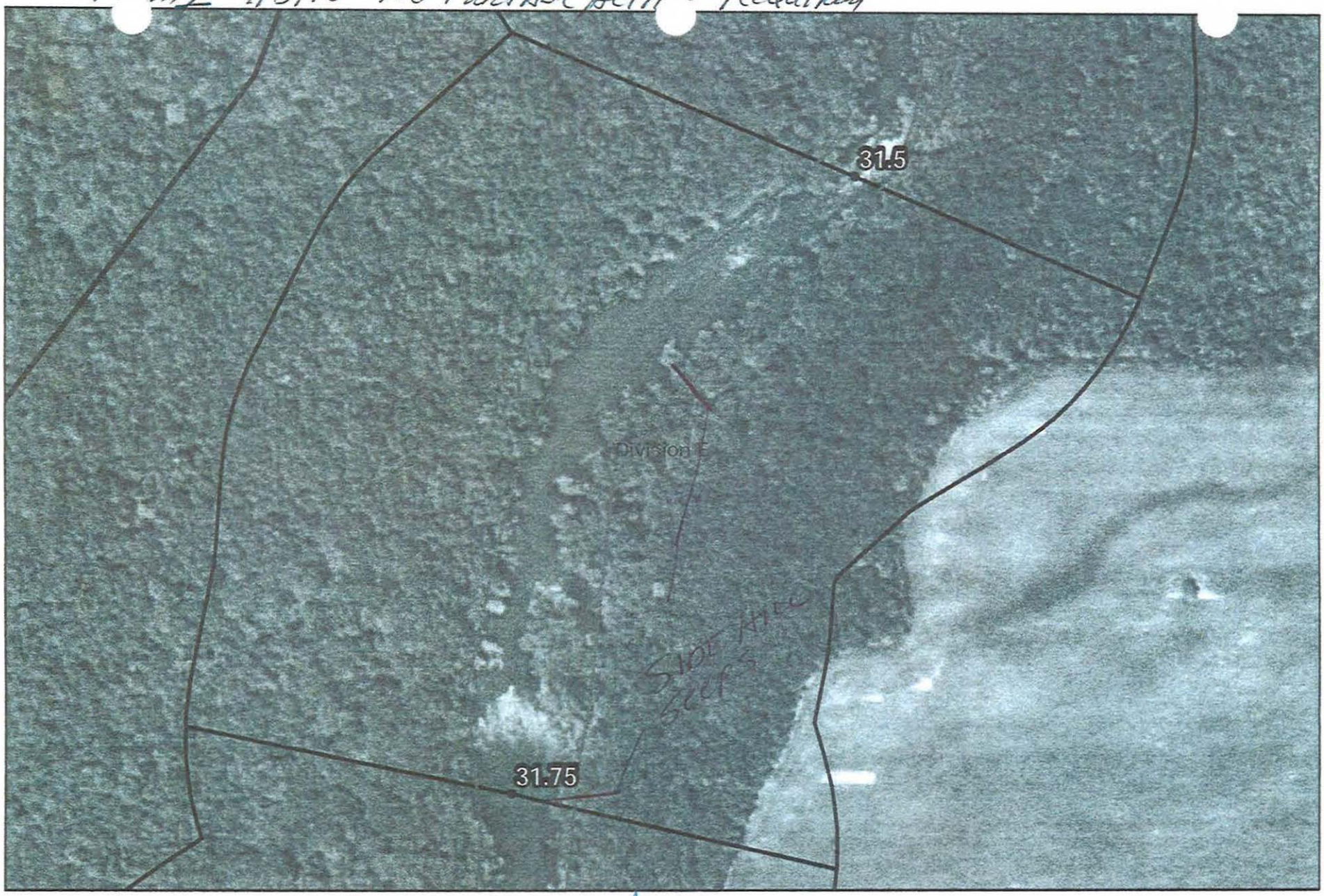
0 75 150 Feet

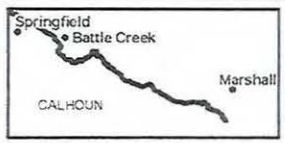
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

NFAR
LPB

31.5-31.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

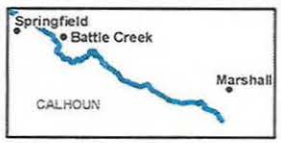
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 31.5-31.75 Right Bank While Looking Downstream										
EPA-E-0026	Main Channel	SCAT T1 8/19/2010	183-184 - no oil observed					No cleanup recommendations.	42.31048	-85.36957





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 31.5-31.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

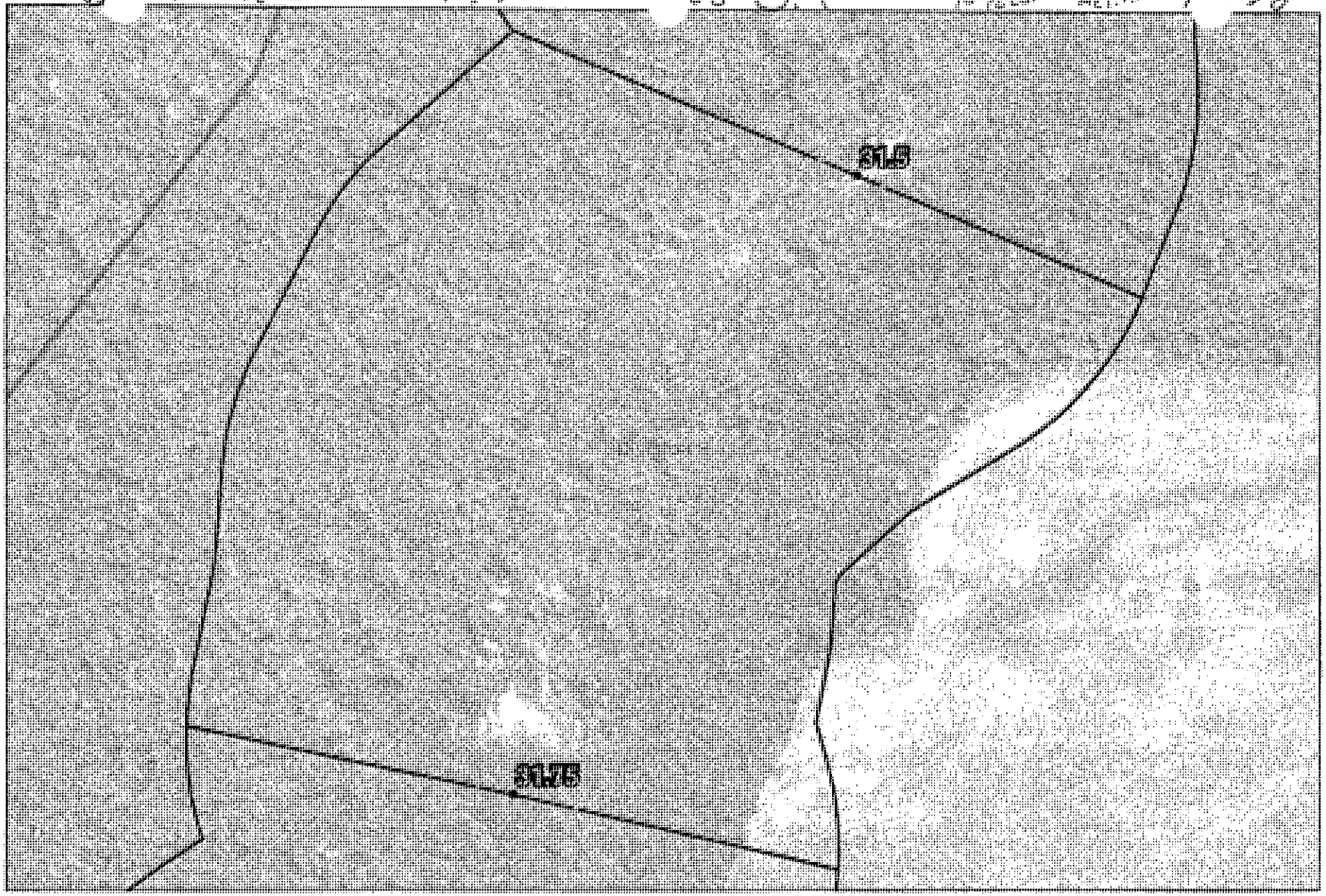
0 75 150
Feet

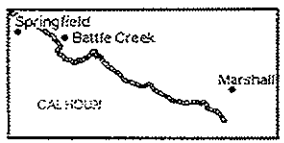
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

31.5-31.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 31.5 **to MP** 31.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAM	9/10/10 (date)	Enbridge
Signature	9/10/10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Loan	9/11/10 (date)	Enbridge
Signature HOWARD PHAM	9/11/10 (date)	EPA
Signature Chris Conn	9/14/10 (date)	MDNRE

5. **EPA**

Signature GARY LYPSON	9/15/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 31.75



Photo 0260 – Looking north at right descending bank.



Photo 0261 – Looking south at left descending bank. Near EPA-E-0026.

Field Photo Log – Segment MP 31.75



Photo 0262 – Looking southwest at right descending bank.

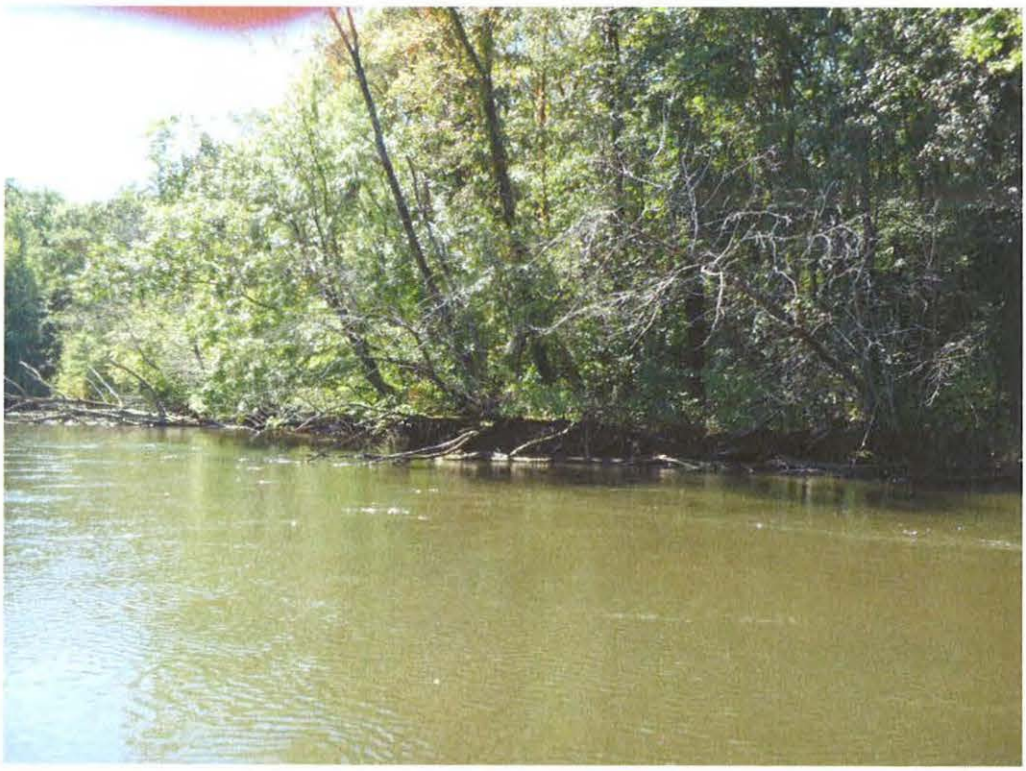


Photo 0263 – Looking southwest at right descending bank.



Photo 0264 – Looking east at left descending bank/island.



Photo 0265 – Looking east at left descending bank/island.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 32.0 – MP 31.75 to 32.0

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 32.0 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that require special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 32.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Doeumentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution

C	Continuous	91 - 100%
B	Broken	51 - 90%
P	Patchy	11 - 50%
S	Sporadic	1 - 10%
T	Trace	<1%

Surface Oiling Descriptors - Width

Very Narrow	< ____ m
Narrow	>____ - <____ m
Medium	>____ - <____ m
Wide	< ____ m

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

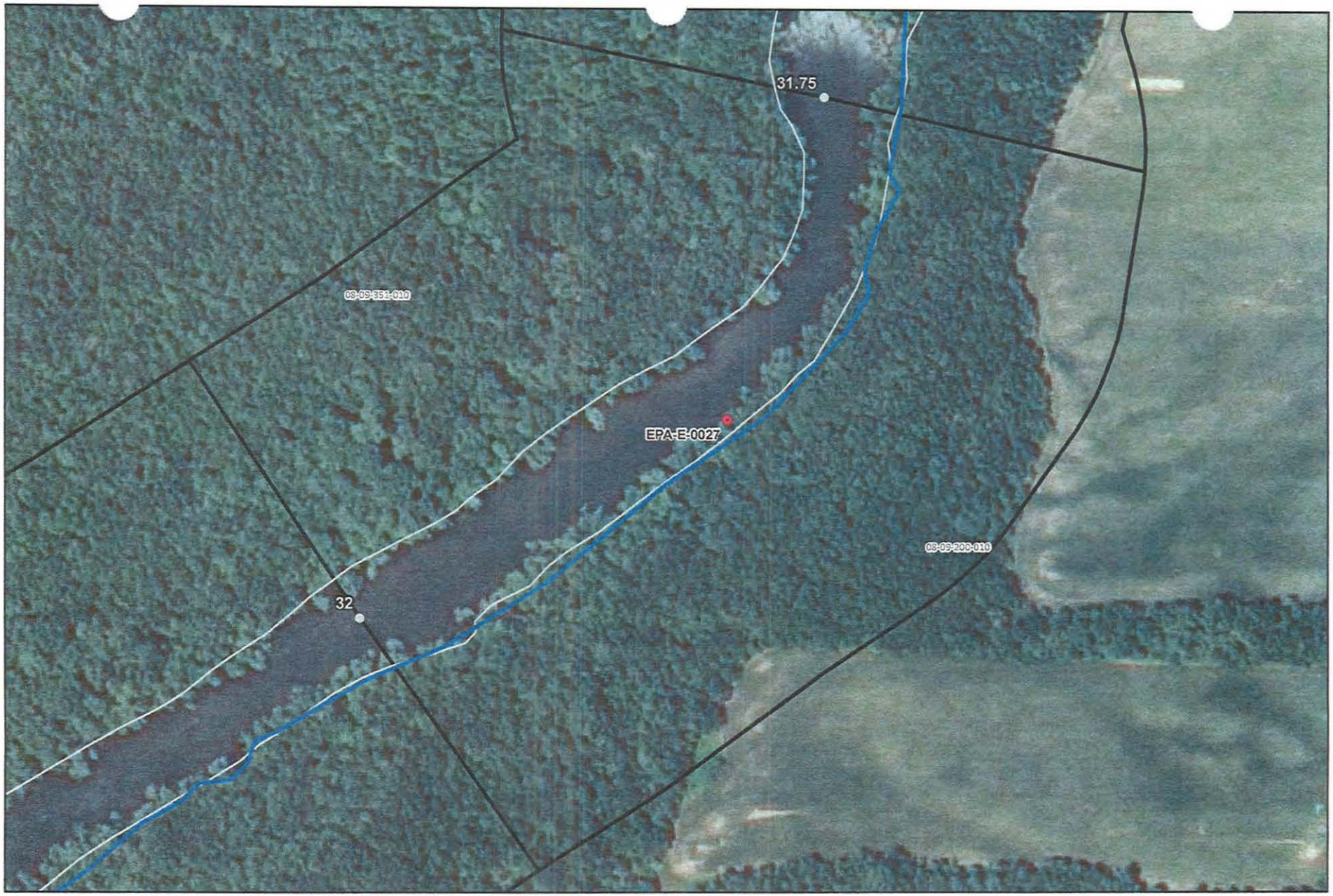
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

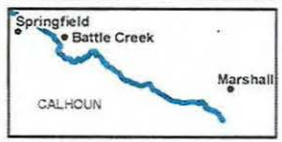
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In[illegible]nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 31.75-32.0 Left Bank While Looking Downstream										
EPA-E-0027	Main Channel	SCAT T1 8/19/2010	WP-185-186 - no observed oil					No cleanup recommendations.	42.30630	-85.37190





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 31.75-32
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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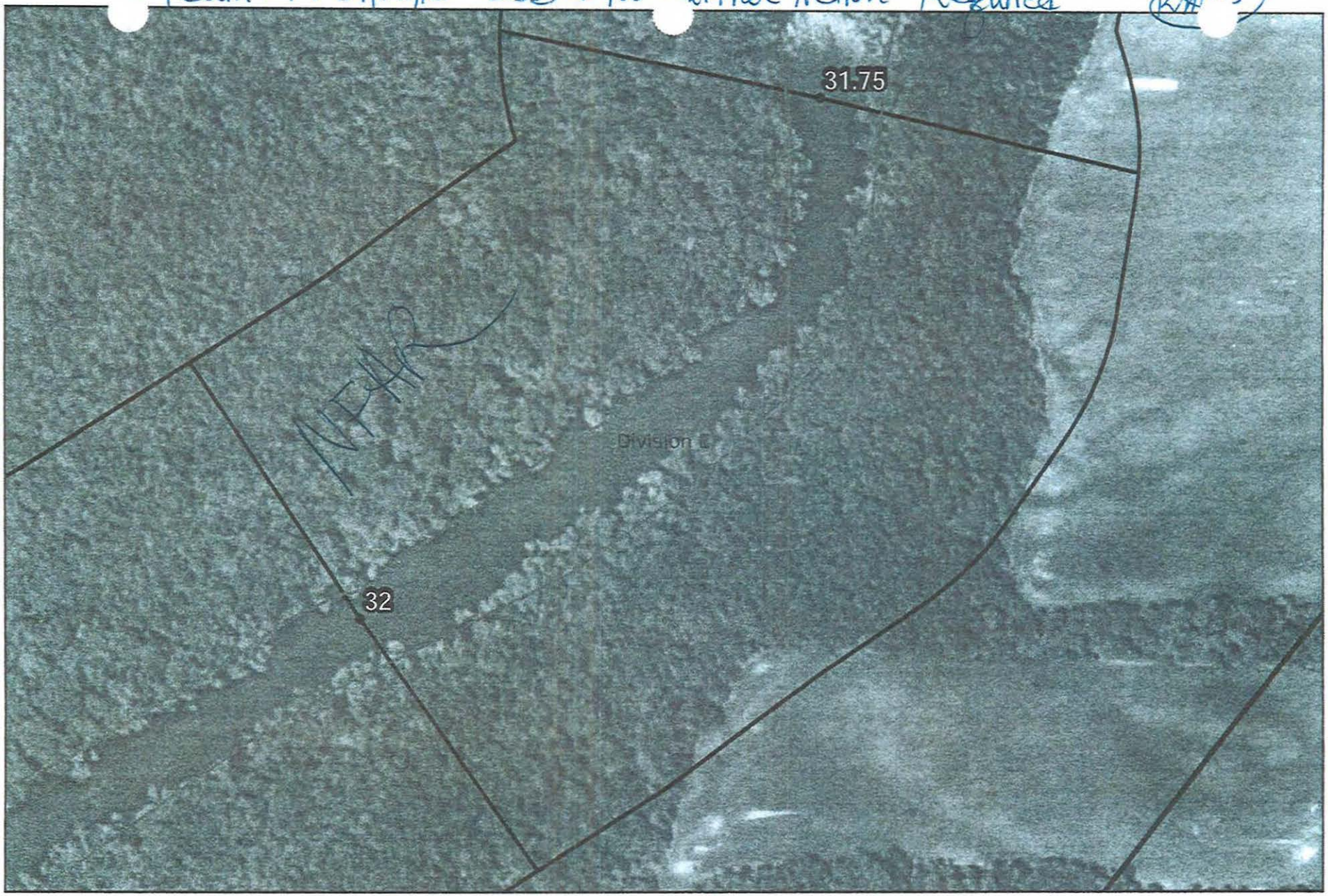
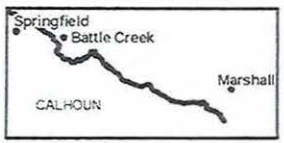
Coordinate System: NAD 1983 State Plane Michigan South Feet

Team #1 - 09/02/10 LDD → No further action required (KMA)





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

NEAR KMA

31.75-32

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

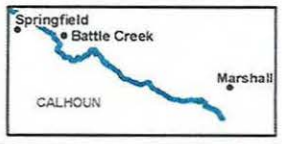
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Ir[illegible]nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 31.75-32.0 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 31.75-32
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

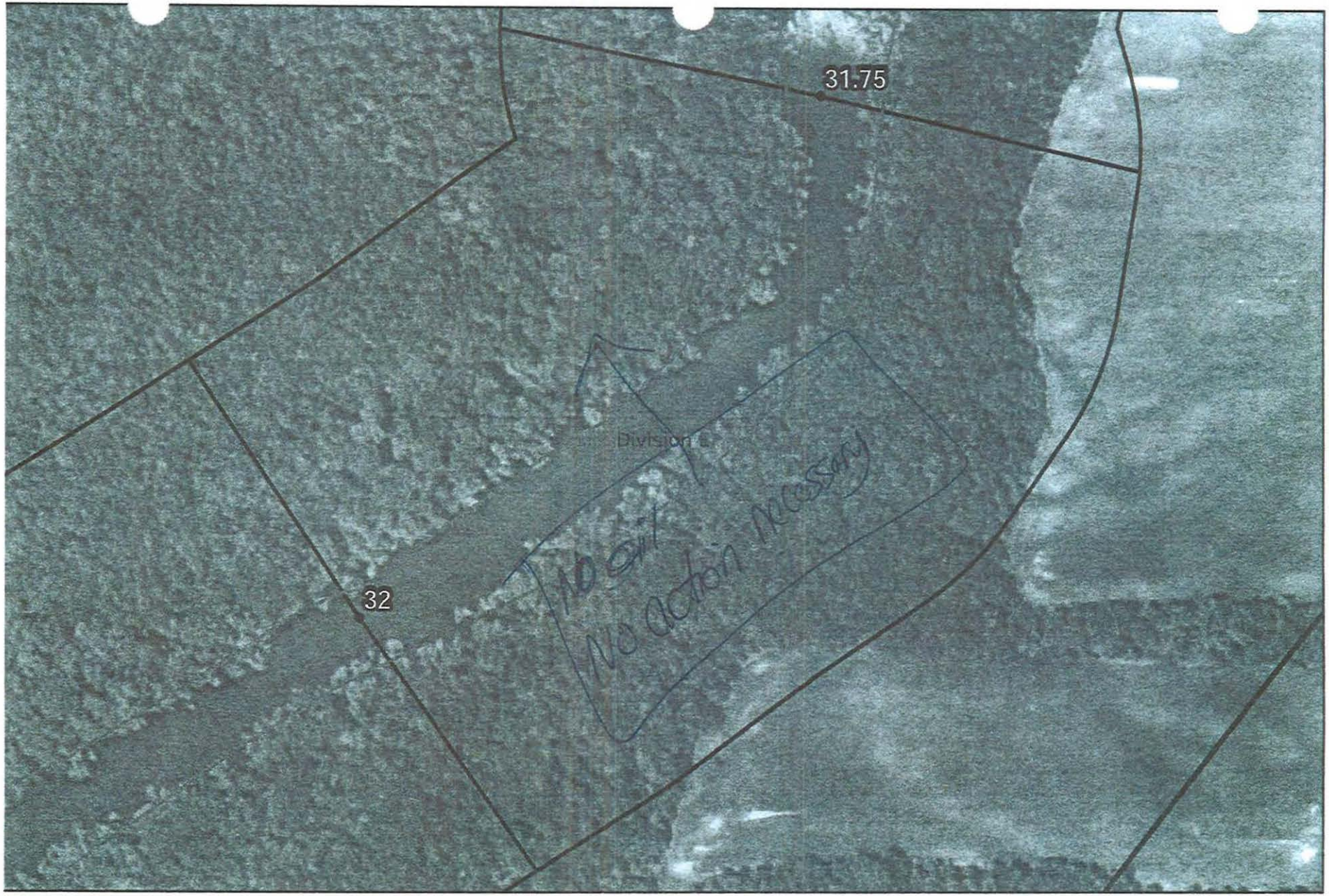
0 75 150
Feet

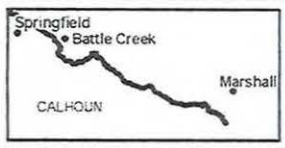
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





- Quarter Mile Segment
- Divisions
- Shoreline
- River_QuarterMiles

Team 3 9-3-2010

31.75-32

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 31.25 **to MP** 32.0 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

[signature] 9-1-10 Enbridge
Signature CHRISTOP HERHAUX (date)

M J Nalipinski 1 Sept 10 EPA
Signature (date)
M J NALIPINSKI

4. **SCAT Reassessment**

Pamela E. Rice 9-5-10 Enbridge Glenn Vande Wate 9/5/10
Signature (date) Glenn Vande Wate
Pamela E. RICE

Kathleen M. Foley 09-05-10 EPA Michelle Kerr
Signature (date) MICHELLE KERR 09.05.10
Kathleen M. Foley

[signature] 9-5-2010 MDNRE Chris Yeldkamp 9/7/10
Signature (date)
Rachel Matthews

5. **EPA**

[signature] 9/14/10 EPA Division Supervisor
Signature (date)

Revised 8/29/10

Appendix E
Photos



Photo 0266 – Looking south at left descending bank.



Photo 0267 – Looking southwest at right descending bank.

Field Photo Log – Segment MP 32.00



Photo 0268 – Looking south at left descending bank. Near EPA-E-0027.



Photo 0269 – Looking west at right descending bank.



Photo 0270 – Looking south at left descending bank.



Photo 0271 – Looking west at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 32.25 – MP 32.0 to 32.25

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 32.25 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 32.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In[illegible]nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 32.0-32.25 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 32-32.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

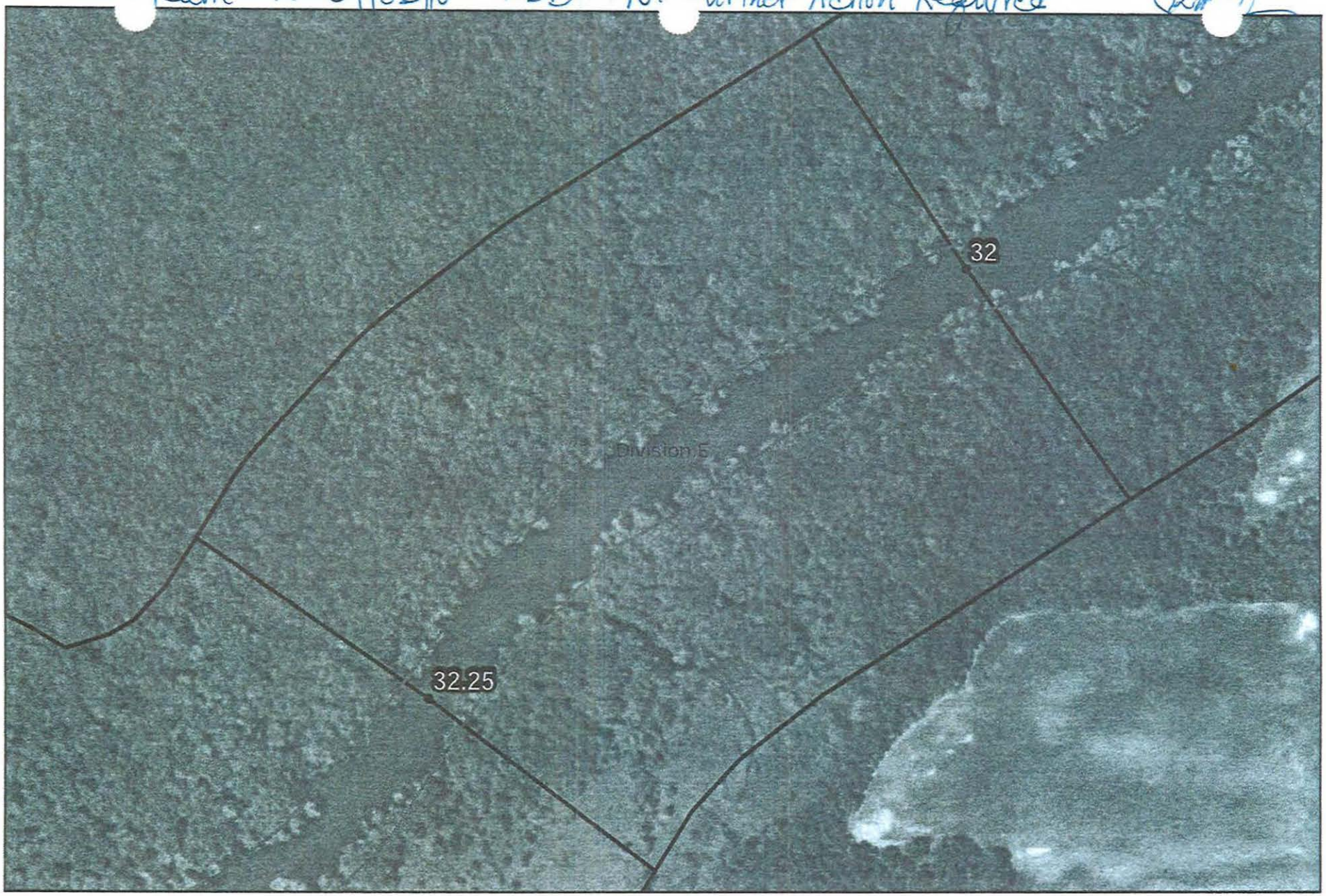
0 75 150
Feet

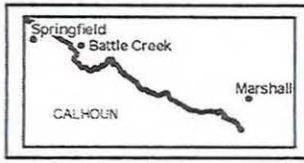
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team # 1. 09/03/10 LDB → No Further Action Required





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

NFAR

32-32.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

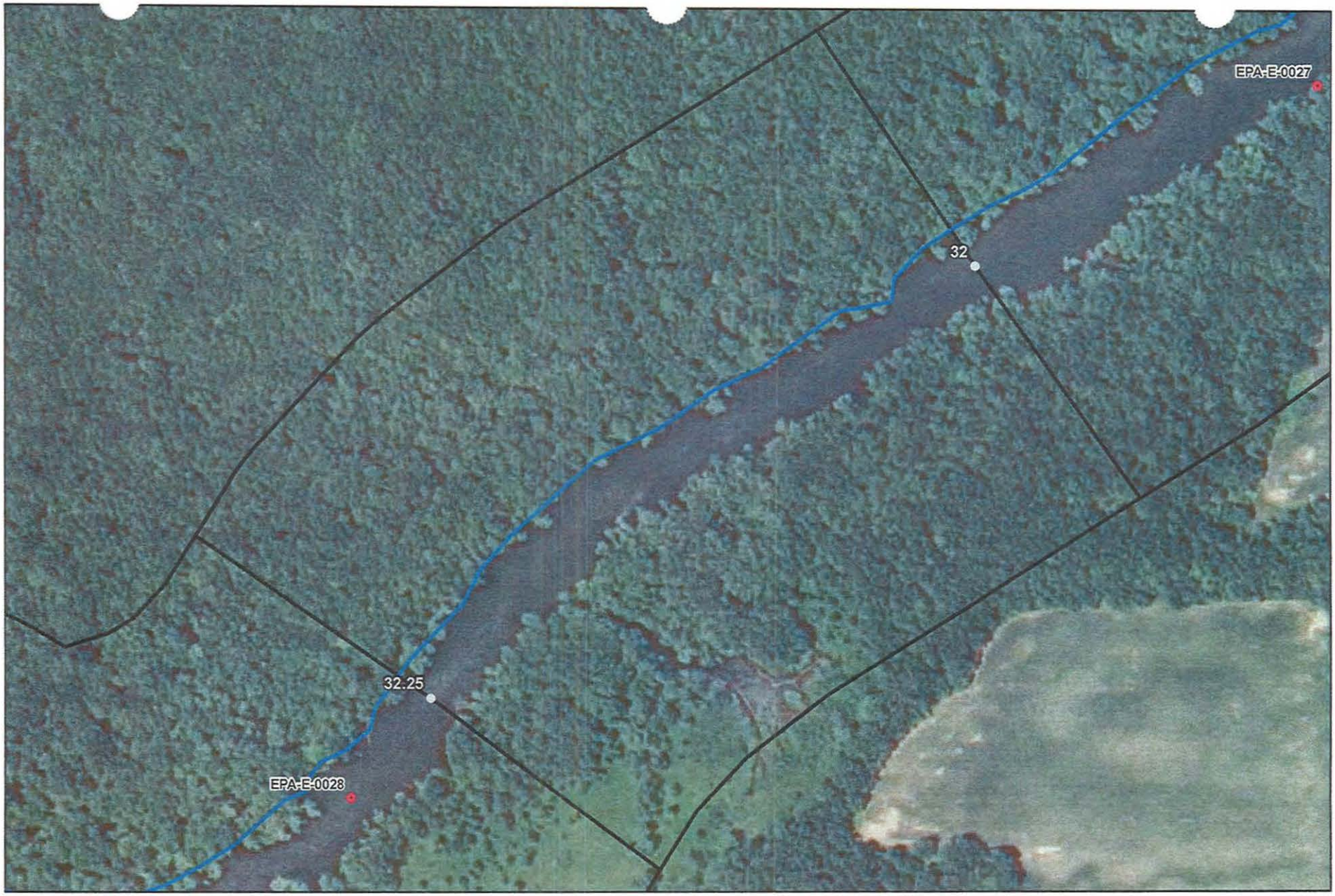
www.entrix.com

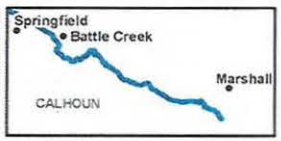
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 32.0-32.25 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 32-32.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

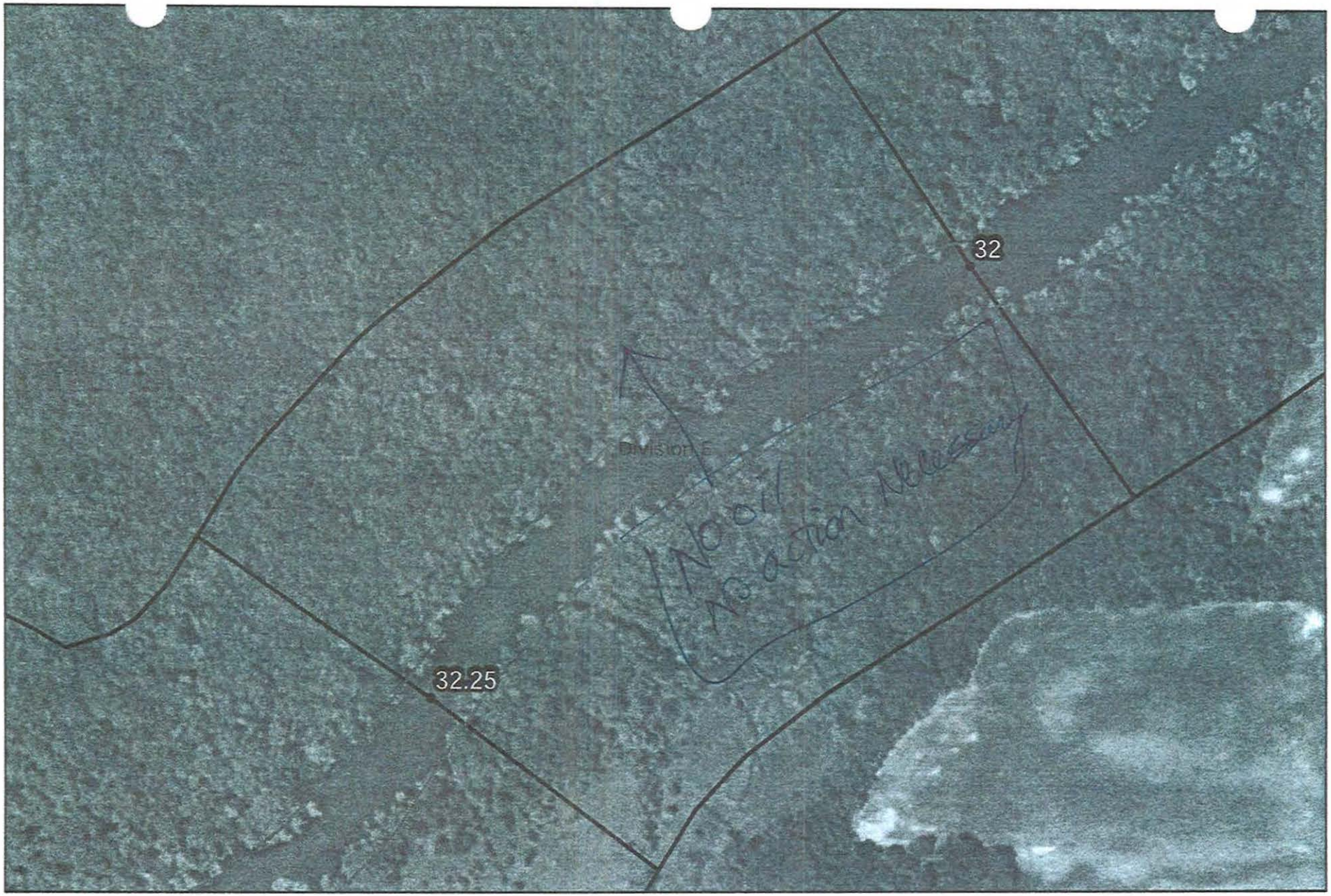
0 75 150
Feet

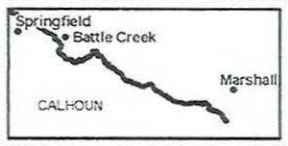
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





- Quarter Mile Segment
- Divisions
- Shoreline
- River_QuarterMiles

Team 3 9-3-2010

32-32.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 32.0 **to MP** 52.25 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAWK	9-1-10 (date)	Enbridge
Signature M J KALPINSKI	1 Sept '10 (date)	EPA

4. **SCAT Reassessment**

Signature Pamela E. Rice	9-5-10 (date)	Enbridge	Glenn Vandewalker 9/5/10
Signature Kathleen M. Foley	09-05-10 (date)	EPA	Michelle Kerr 09.05.10
Signature Rachel Matthews	9-5-2010 (date)	MDNRE	Chris Yeackering 9/7/10

5. **EPA**

Signature GARY LIPSON	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 32.25



Photo 0272 – Looking south at left descending bank.



Photo 0273 – Looking west at right descending bank.

Field Photo Log – Segment MP 32.25

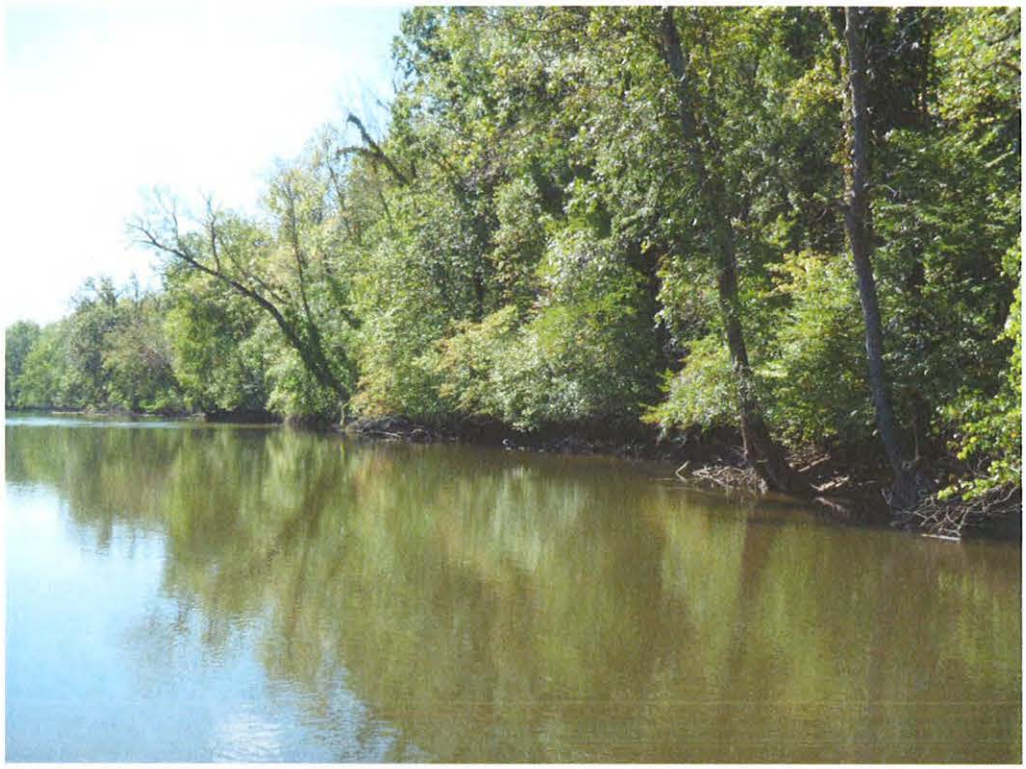


Photo 0274 – Looking west at right descending bank.



Photo 0275 – Looking south at left descending bank.

Field Photo Log – Segment MP 32.25



Photo 0276 – Looking west at right descending bank.



Photo 0277 – Looking south at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 32.5 – MP 32.25 to 32.5

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline segment of 32.50 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 32.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
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Surface Oiling Descriptors - Thickness

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CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
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Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
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Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 3

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

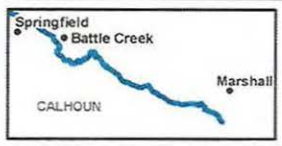
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 32.25-32.5 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 32.25-32.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

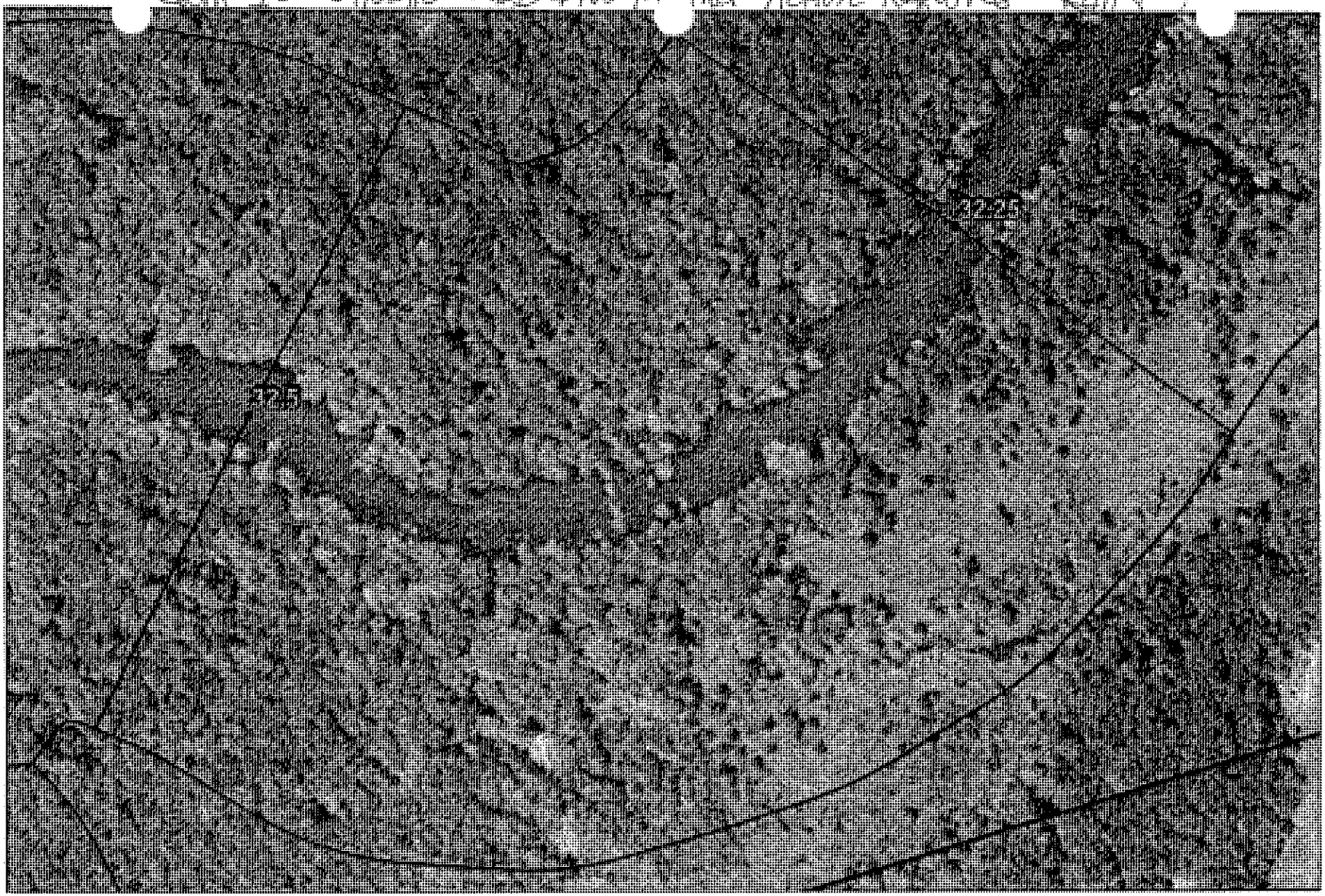
0 75 150 Feet

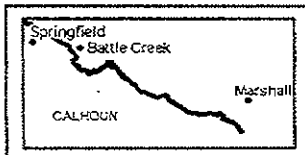
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

32.25-32.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

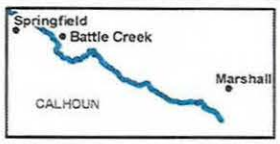
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release fr[illegible]nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 32.25-32.5 Right Bank While Looking Downstream										
EPA-E-0028	Main Channel	SCAT T1 8/19/2010	184-185 - no observed oil					No cleanup recommendations.	42.30257	-85.37855





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 32.25-32.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

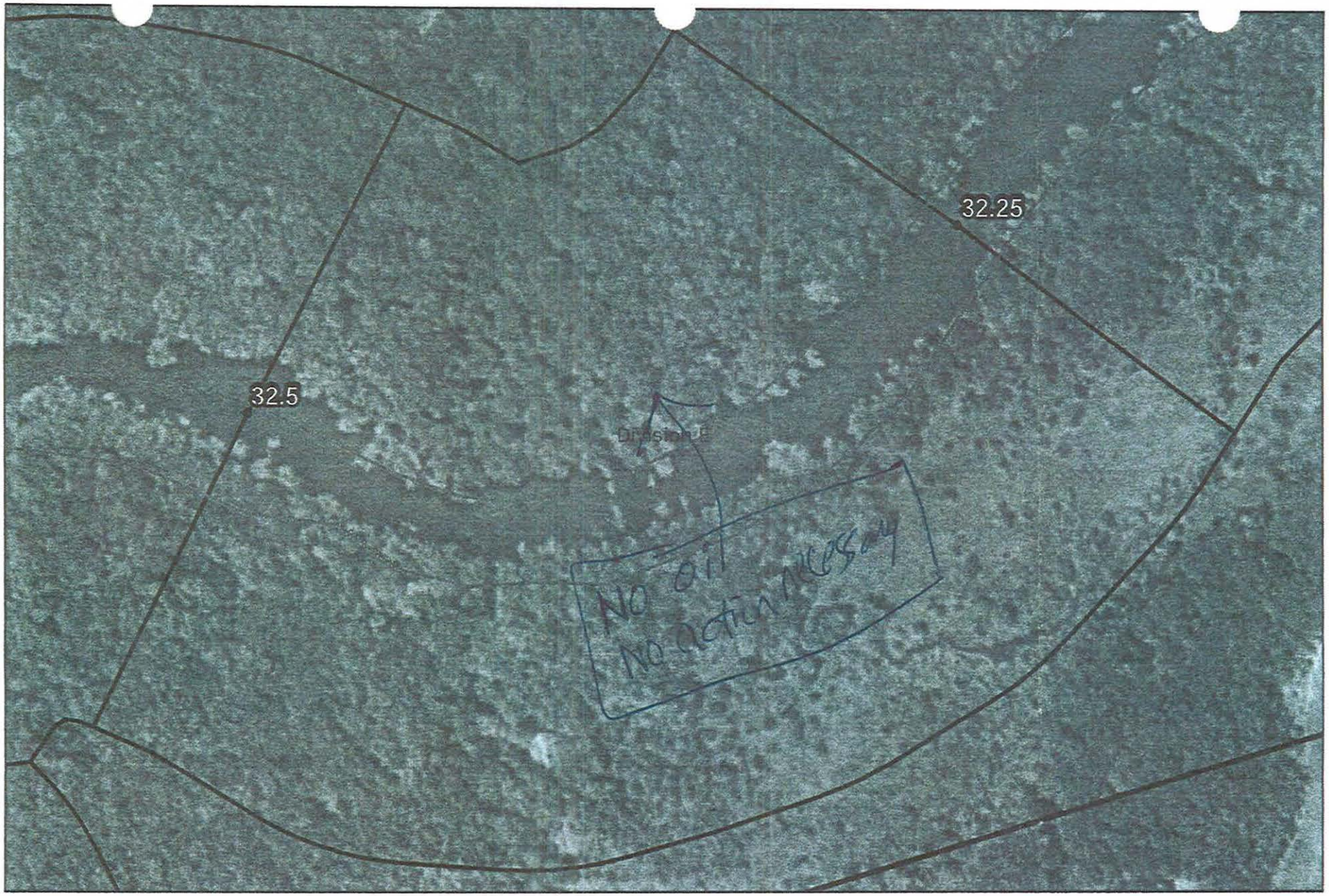
0 75 150 Feet

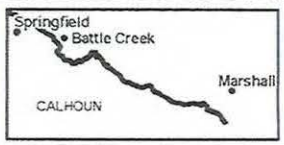
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

Team 3 9-3-2010
32.25-32.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION **Operations Division:** E **Segment ID: From MP** 32.25 **to MP** 32.5 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

[signature] 9-1-10 Enbridge
Signature CHRISTOPHER HAUX (date)

[signature] 1 Sept 10 EPA
Signature (date)
M J NALIPINSKI

4. **SCAT Reassessment**

[signature] 9-5-10 Enbridge [signature] 9/5/10
Signature (date)
Pamela E. Rice
Glenn Vande Water

[signature] 09-05-10 EPA [signature]
Signature (date)
Kathleen M. Foley
MICHELLE KERR 09.05.10

[signature] 9-5-2010 MDNRE [signature] 9/7/10
Signature (date)
Rachel Matthews

5. **EPA**

[signature] 9/14/10 EPA Division Supervisor
Signature (date)
GARY LIPSON

Appendix E
Photos

Field Photo Log – Segment MP 32.50



Photo 0278 – Looking west at right descending bank.



Photo 0279 – Looking south at left descending bank.

Field Photo Log – Segment MP 32.50



Photo 0280 – Looking southeast at left descending bank. Near EPA-E-0028.



Photo 0281 – Looking northwest at right descending bank.

Field Photo Log – Segment MP 32.50



Photo 0282 – Looking southwest at left descending bank.



Photo 0283 – Looking northwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 32.75 – MP 32.5 to 32.75

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil completion report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 32.75 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Cleanup Recommendation Methods.

Outcome

No clean-up activities were undertaken and no oiling conditions were observed. Segment 32.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 32.5-32.75 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 32.5-32.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

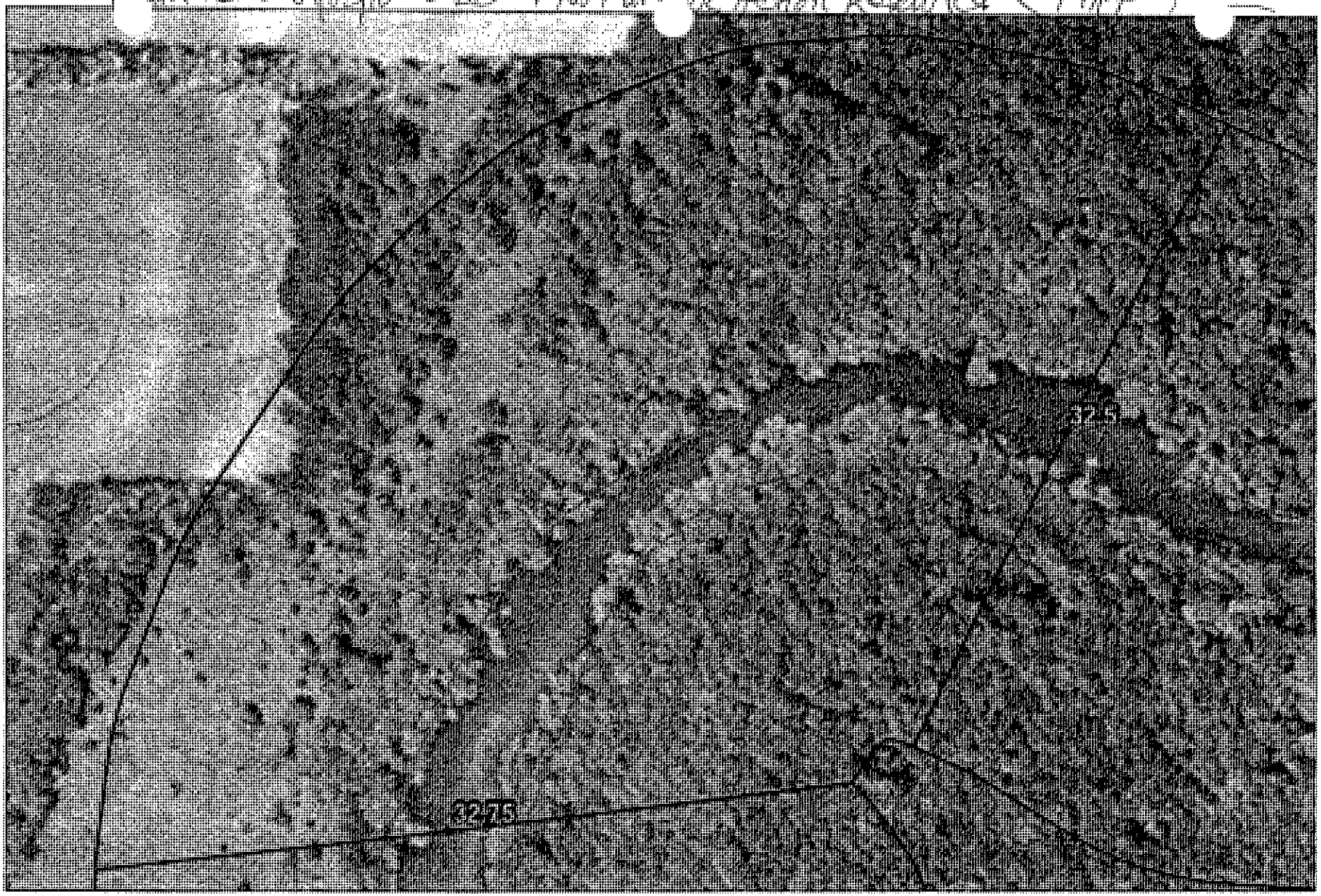
0 75 150 Feet

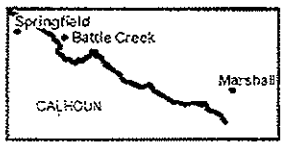
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

32.5-32.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

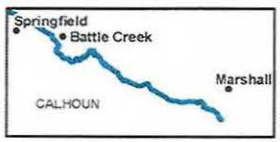
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In[illegible]nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 32.5-32.75 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 32.5-32.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

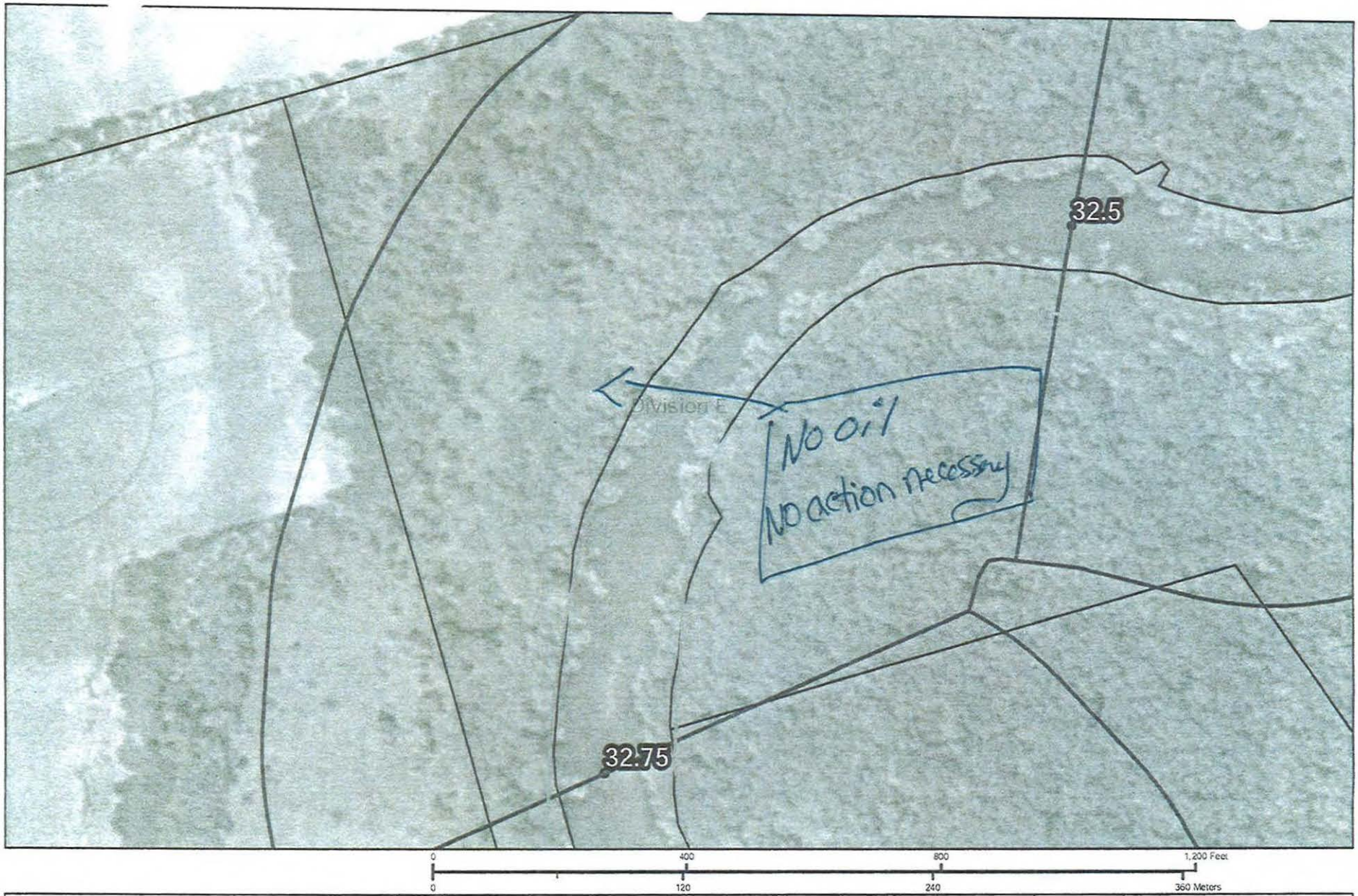
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet



QuarterMileMarkers
Parcels_10200ftBuffer
Shoreline
River_QuarterMiles
Divisions

Team 3 9-3-2010

32.5 to 32.75

Enbridge Pipeline Release Incident – Kalamazoo River Oil Spill

Image: 2009 NAIP

SHEET # 48

ENTRIX
Down to Earth. Down to Business.

www.entrix.com

Coordinate System: NAD 1983 STATE PLANE MICHIGAN SOUTH FEET

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 32.5 **to MP** 32.75 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature	(date)	
CHRISTOPHER MAUK	9/10/10	Enbridge
	9/10/10	EPA

4. **SCAT Reassessment**

Signature	(date)	
Michael Van Loan	9/4/10	Enbridge
HOWARD PLANT	9/11/10	EPA
Chris Coon	9/14/10	MDNRE

5. **EPA**

Signature	(date)	
GARY LIPSON	9/15/10	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 32.75



Photo 0284 – Looking southwest at left descending bank.



Photo 0285 – Looking northwest at right descending bank.

Field Photo Log – Segment MP 32.75



Photo 0286 – Looking southwest at left descending bank.

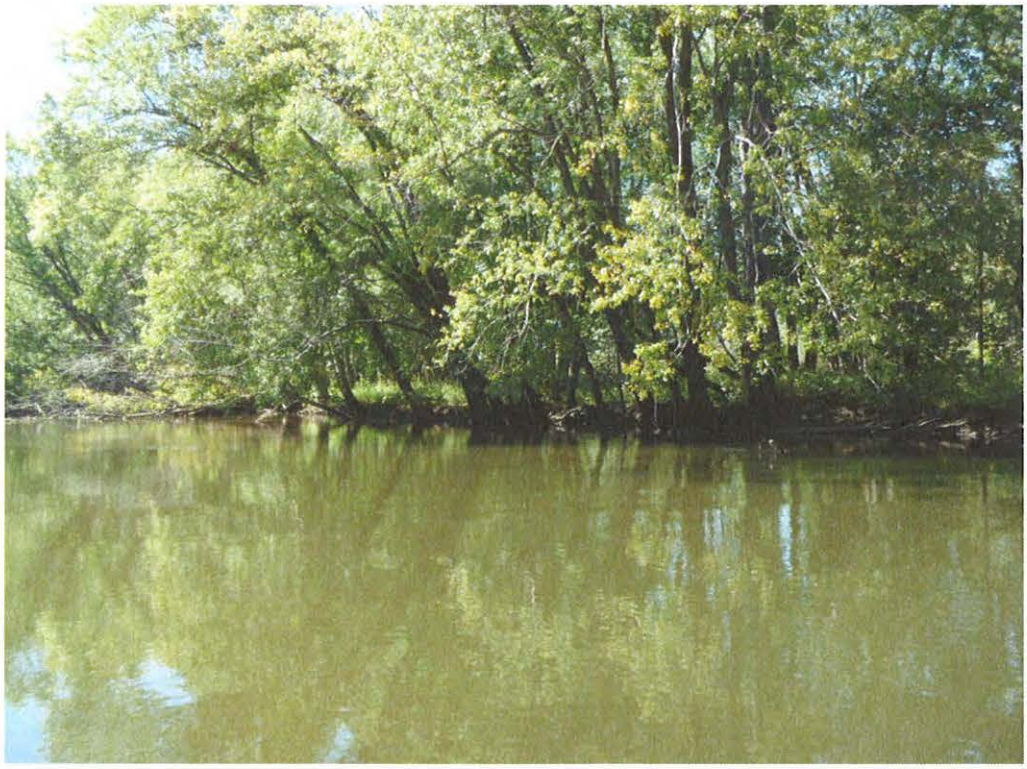


Photo 0287 – Looking northwest at right descending bank.



Photo 0288 – Looking south at left descending bank.



Photo 0289 – Looking southwest at right descending bank.

Field Photo Log – Segment MP 32.75



Photo 0290 – Looking southeast at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 33.0 – MP 32.75 to 33.0

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 33.00 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 33.0 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

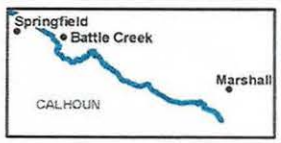
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 32.75-33.0 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 32.75-33
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

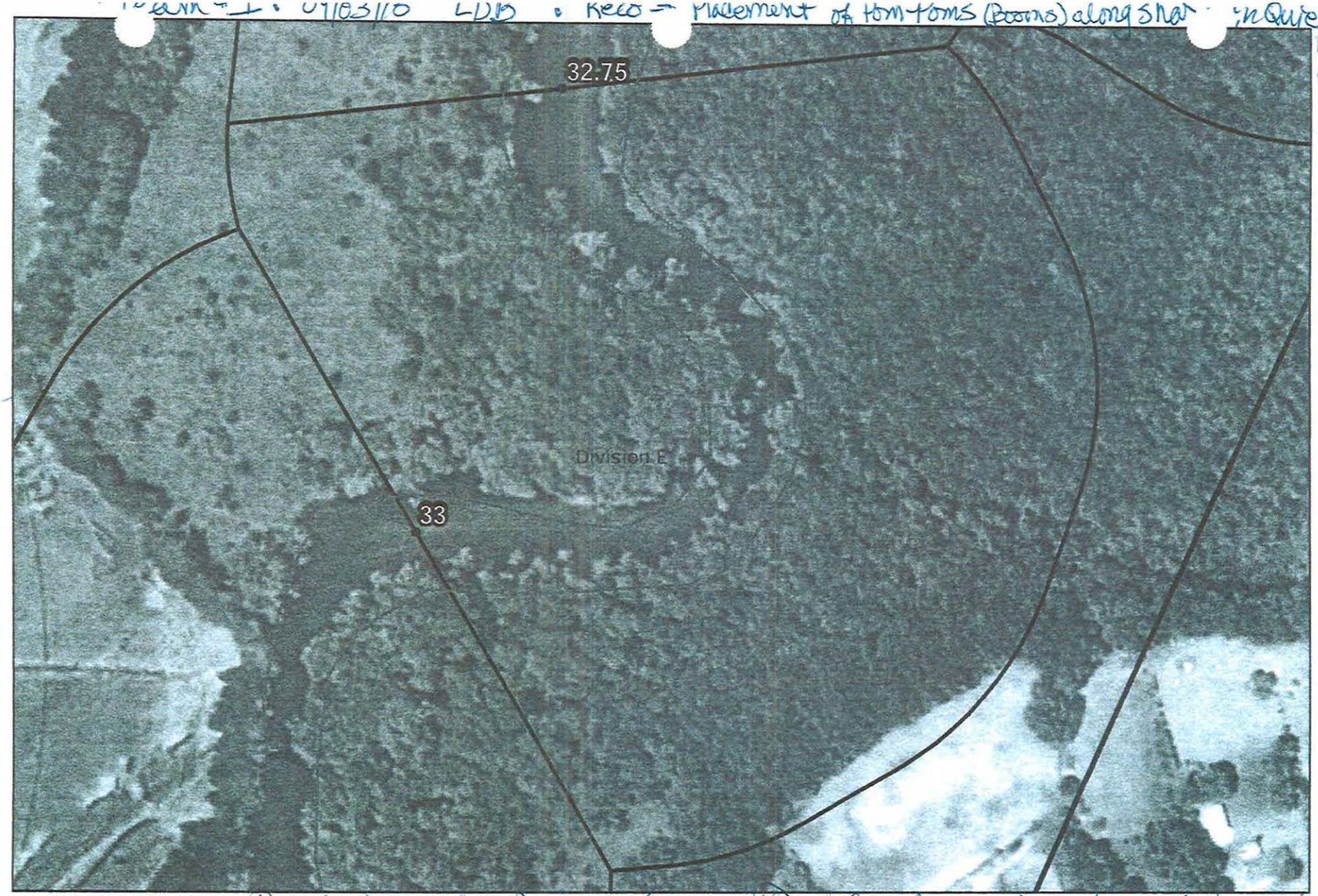
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

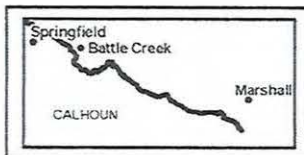
ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team #1 · 09/03/10 LDB · Reco – Placement of Pom-Poms (Booms) along Shar in Quiet Are (Cove



Reco: Placement of Pom-Poms (Boom mat'l) at Cove Areas or Downstream of downed trees which have sediment-generated oil sheens.



Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

32.75-33

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

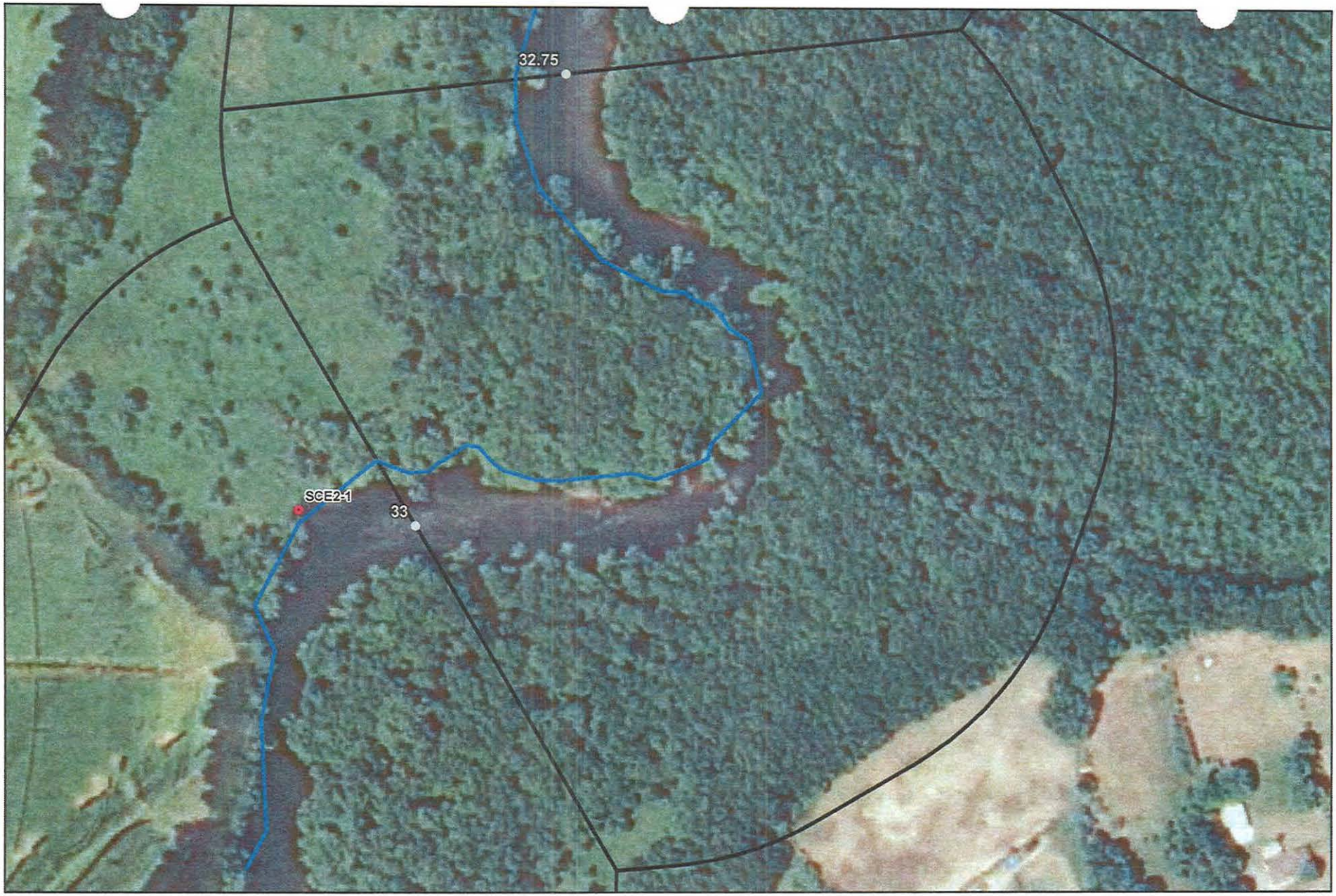
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In... ...t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 32.75-33.0 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 32.75-33
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

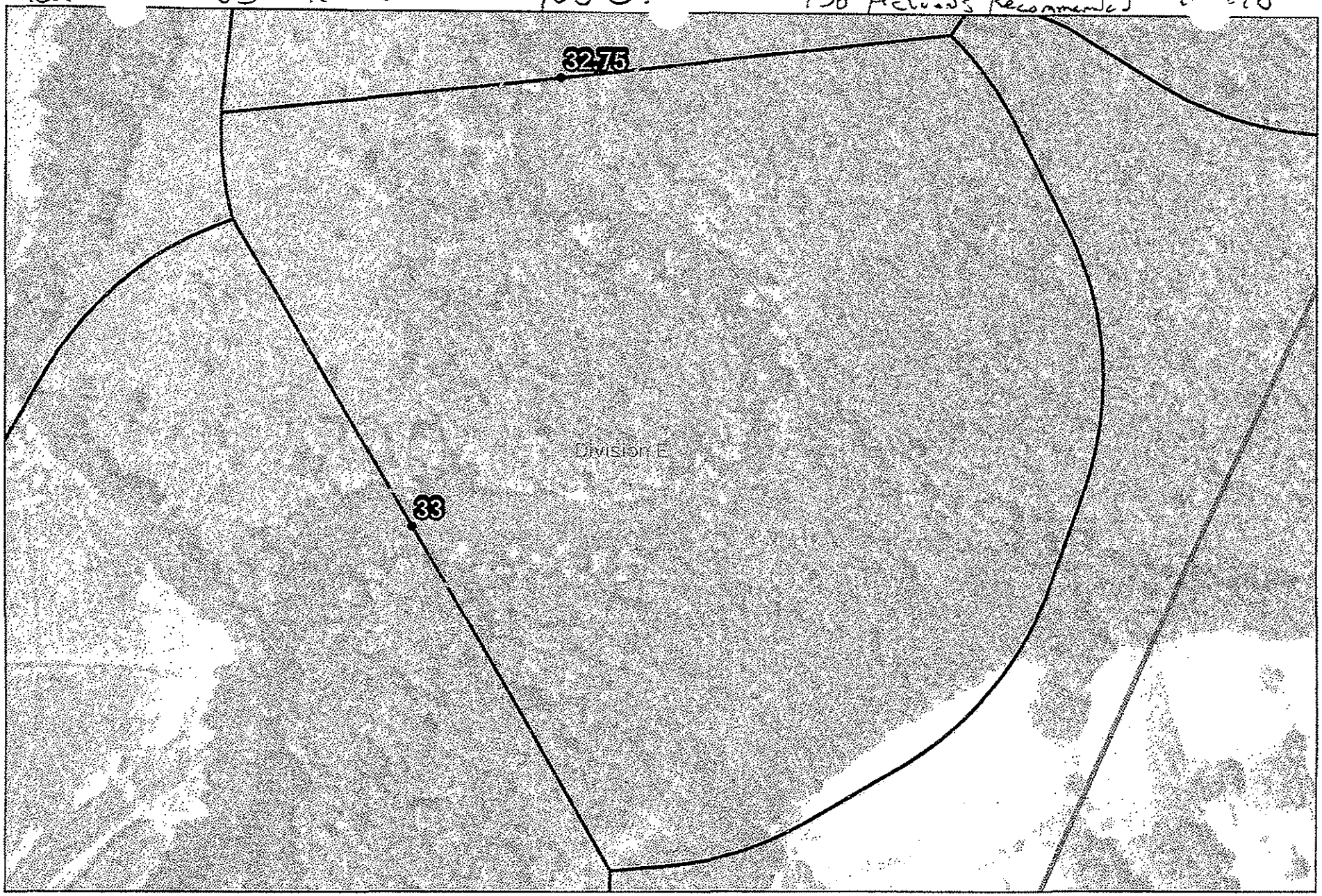
Source: Aerial Photography: USDA, 2009.

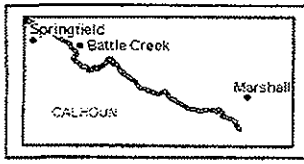
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team: #33 RUB No O: No Actions Recommended





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

32.75-33

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From**_____ **Start MP to End MP**_____ **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 32.75 **to MP** 33.0 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

9-1-10 — Enbridge
Signature CHRISTOPH (date)

1 Sept 10 — EPA
Signature (date)
MJ NALEPINSKI

4. **SCAT Reassessment**

9/7/2010 — Enbridge — Glenn Vande Water 9/7/10
Signature Michael Van Loon (date) Glenn Vande Water

9/7/10 — EPA — Gary A. Andrew 9.7.10
Signature (date) Gary A. Andrew
Kathleen M. Foley

9/7/10 — MDNRE
Signature (date) Kenneth M. Mroczkowski

5. **EPA**

9/14/10 — EPA Division Supervisor
Signature (date)
GARY LIPSON

Revised 8/29/10

Appendix E
Photos



Photo 0291 – Looking southwest at right descending bank.



Photo 0292 – Looking south at left descending bank.



Photo 0293 – Looking southwest at right descending bank.



Photo 0294 – Looking southeast at left descending bank.



Photo 0295 – Looking southwest at left descending bank.



Photo 0296 – Looking northwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 33.25 – MP 33.00 to 33.25

Enbridge Energy

September 18, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 33.25 had no oiling on the left descending bank and oil sheen noted in an alcove on the right descending bank. The overbank contained no areas requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 33.25 consisted of the following:

- High volume low pressure flushing for free oil removal with downstream booming absorbent booms and pads.

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 33.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
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TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
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AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

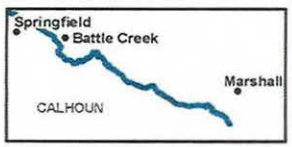
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 33.0-33.25 Left Bank While Looking Downstream										
SCE2-5	Shoreline	Shoreline Assessment	?				Leak?		42.29560	-85.38792
SCE2-6	Shoreline	Shoreline Assessment	•				Sheen.		42.29652	-85.38698





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 33-33.25
Left Bank While Looking Downstream

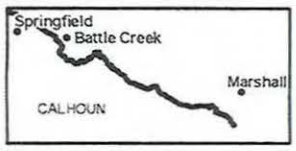
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

33-33.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

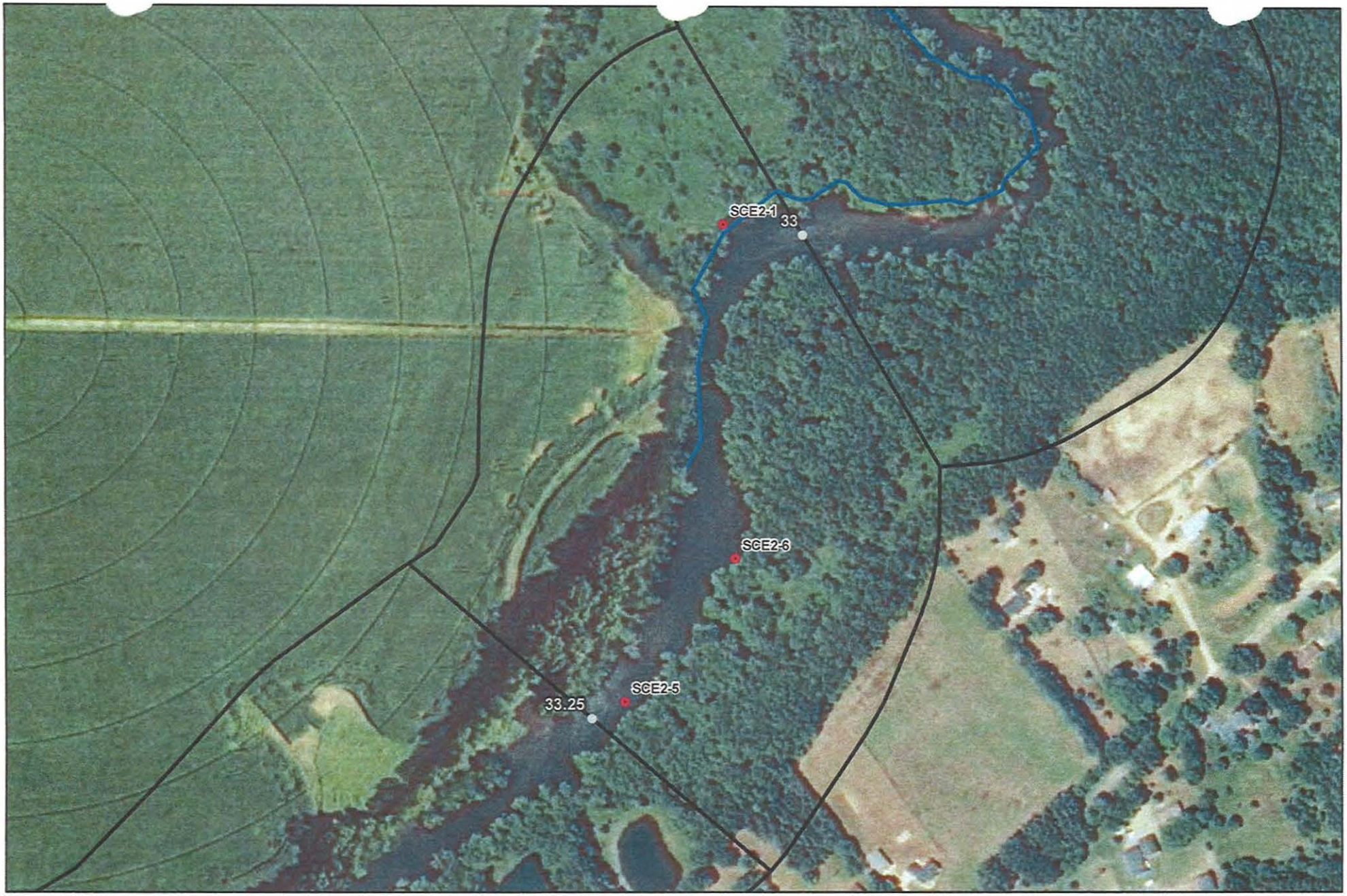
Source: Aerial Photography: USDA, 2009.

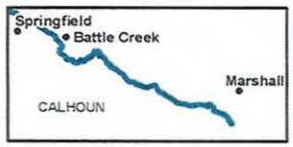
ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 33.0-33.25 Right Bank While Looking Downstream										
SCE2-1	Shoreline	Shoreline Assessment					Oil sheened alcove water area - recommend booming area along shoreline and absorb oil to pads or other absorbents.	Recommend booming area along shoreline and absorb oil to pads or other absorbents.	42.29865	-85.387117





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 33-33.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

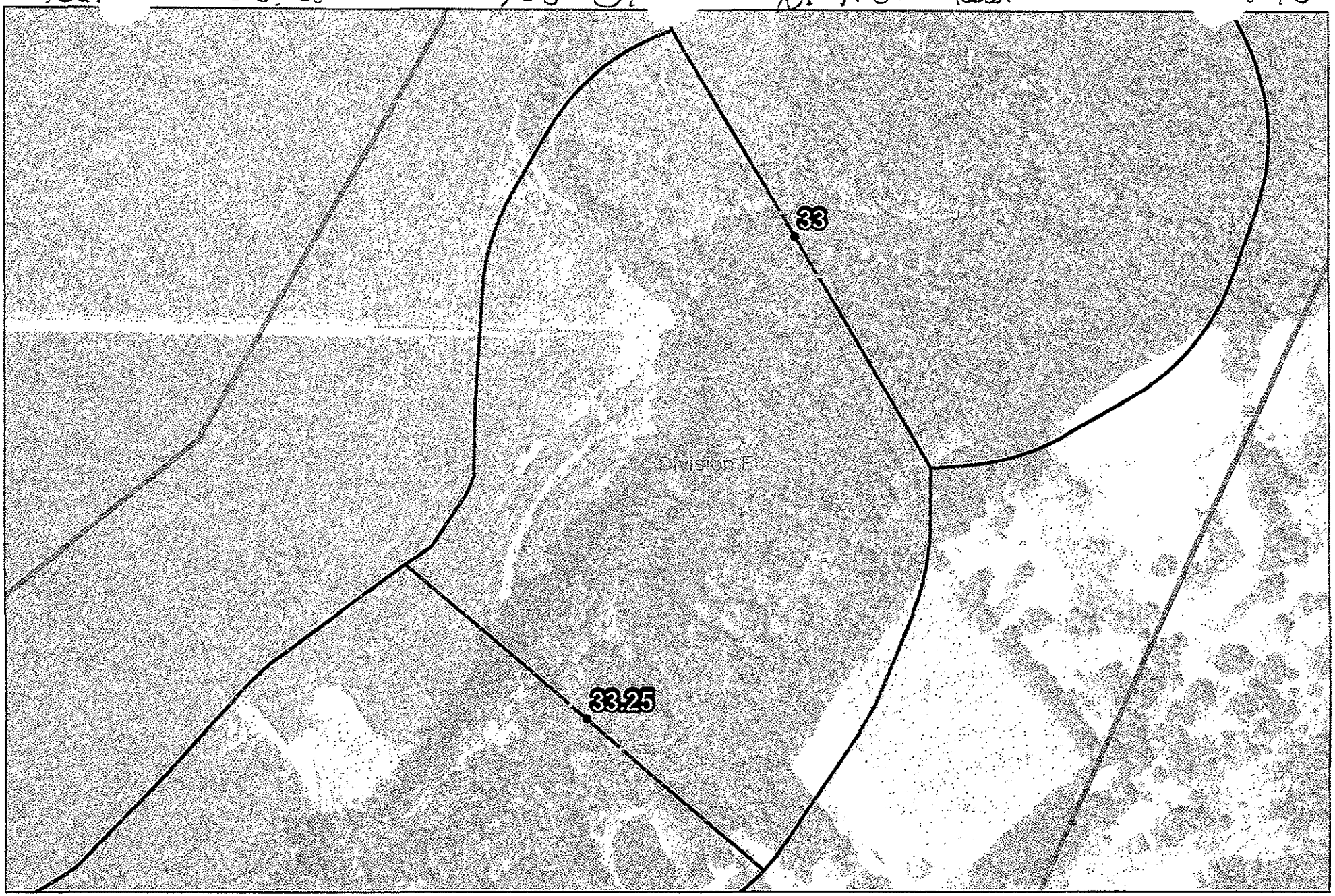
Source: Aerial Photography: USDA, 2009.

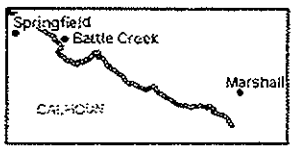
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Sea. 33.25 No Oi No Action Recommend 3.10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

33-33.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: Sept. 12 2010 **Time: AM / PM**

Operations Division: E **Segment ID: From** 332.5 **Start MP to End MP** 332.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/ 57°

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Clean up Completed

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ **SCAT Requirements/Clean Up Complete or NA**

Clean up Completed

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-12-10 **Time: AM / PM**

Operations Division: D **Segment ID: From** 33.0 **Start MP to End MP** 33.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/ Sun

Field Inspection Team

Enbridge Inspector:

Division Supervisor(Contractor):

SCAT Reviewed – Description of Clean Up Required

Reviewed the SCAT report all found 3 areas of concern. Clean up required is flushy, oil spot boom.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected 3 areas in this section and all clean up is complete and the soft boom is still out to catch the light sheen from the flow of the river.

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Appendix C
Step 4 – SCAT Reassessment Documentation

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 33.0-33.25 Left Bank While Looking Downstream										
SCE2-5	Shoreline Assessment	?				Leak?		42.29560	-85.38792	(Y) / N
SCE2-6	Shoreline Assessment	.				Sheen.		42.29652	-85.38698	(Y) / N

Printed Team Members Names: MIKE ZAMBETIS

Date: 9/13/10

Comment: HOWARD PRYAM, EPA
Kathleen Fairchild, DNRE

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 33.0-33.25 Right Bank While Looking Downstream										
SCE2-1	Shoreline Assessment					Oil sheened alcove water area - recommend booming area along shoreline and absorb oil to pads or other absorbents.	Recommend booming area along shoreline and absorb oil to pads or other absorbents.	42.29865	-85.387117	(Y) / N

Printed Team Members Names: MIKE ZAMBETIS
Date: 9/13/10
Comment: HOWARD PREAM, EPA.
Kathleen Fairchild, DNRE

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 33.00 to MP 33.25 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature Ken Costley (date) 12-Sept-2010 Enbridge

Signature Eugene Dennis (date) 9-13-2010 EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBETIS (date) 9/13/10 Enbridge

Signature HOWARD PHAM (date) 9/13/10 EPA

Signature Kathleen Fairchild (date) 9/13/10 MDNRE

5. **EPA**

Signature GARY GIBSON (date) 9/19/10 EPA Division Supervisor

Appendix E
Photographs



Photo 0555 – Looking northwest at right descending bank, near SCE2-1.



Photo 0556 – Looking northwest at right descending bank, near SCE2-1.



Photo 0557 – Looking south at left descending bank.



Photo 0558 – Looking southwest at right descending bank.



Photo 0559 – Looking southwest at right descending bank.



Photo 0560 – Looking east at left descending bank, near SCE2-6.



Photo 0561 – Looking southeast at left descending bank, near SCE2-6.

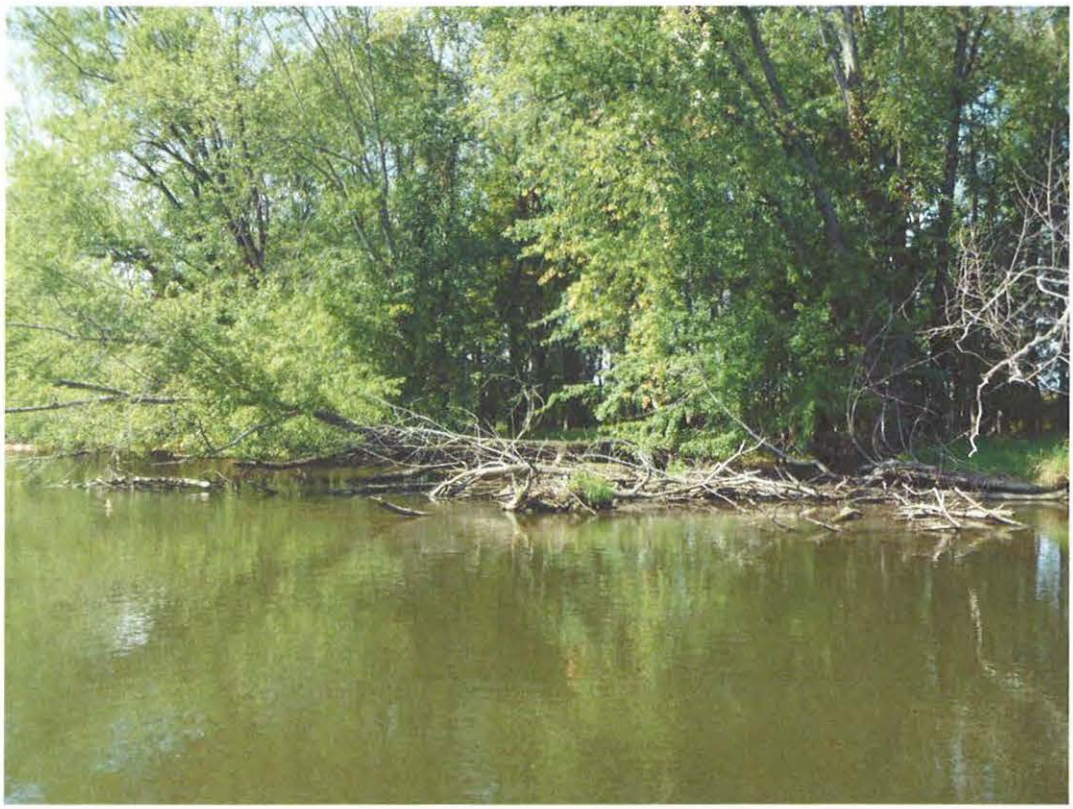


Photo 0562 – Looking southwest at right descending bank.

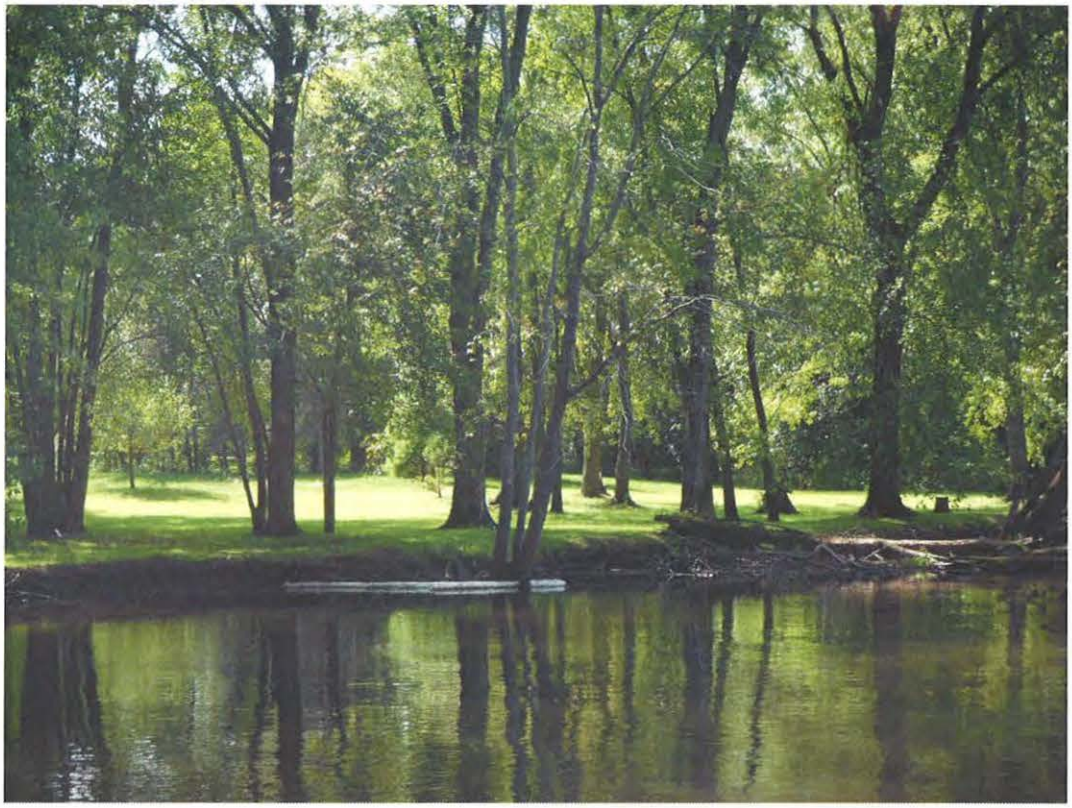


Photo 0563 – Looking southeast at left descending bank, near SCE2-5.



Photo 0564 – Looking southwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 33.5 – MP 33.25 to 33.5

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 33.50 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 33.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

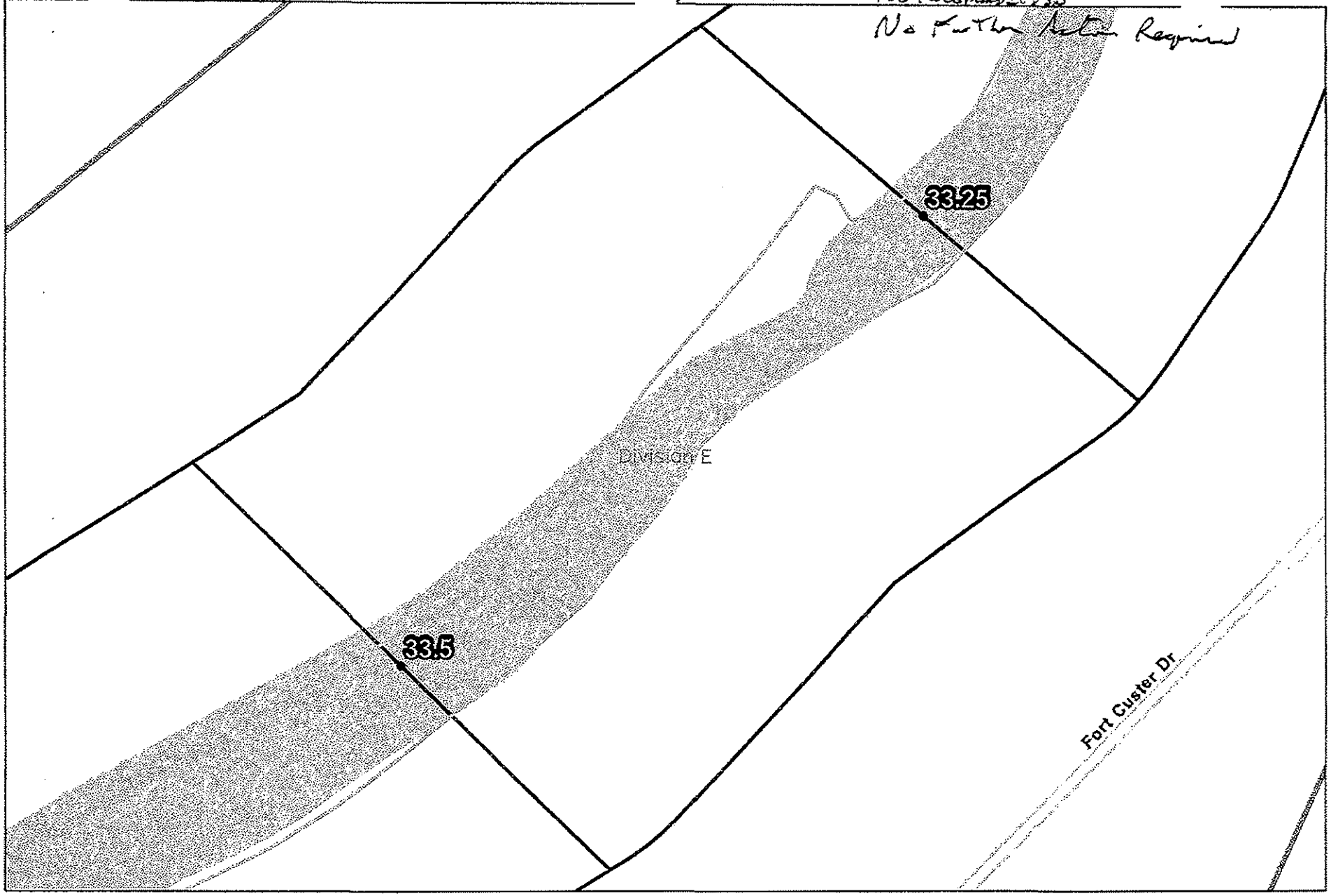
Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

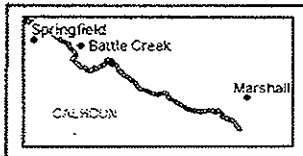
OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 33.25-33.5 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			


SCE2-6
SCE2-5
33.25
33.5
08-17-401-011
08-17-401-020
08-17-376-060
08-17-376-052
08-17-376-040
08-17-376-051
08-17-376-021
08-17-376-010
08-17-451-011
08-17-390-020
08-17-351-086
08-17-351-082
Springfield
Battle Creek
Marshall
CALHOUN
River Quarter Miles
Operational Focus Area
Pooled Oil
Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
Division E: Mile Marker 33.25-33.5
Left Bank While Looking Downstream
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill
0 75 150
Feet
Source: Aerial Photography: USDA, 2009.
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Team " # 33.5 LDJ NO Oil No Recommendation 9 7-10
No Further Action Required





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

33.25-33.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

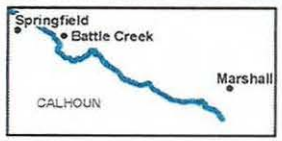
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Ir. nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 33.25-33.5 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 33.25-33.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

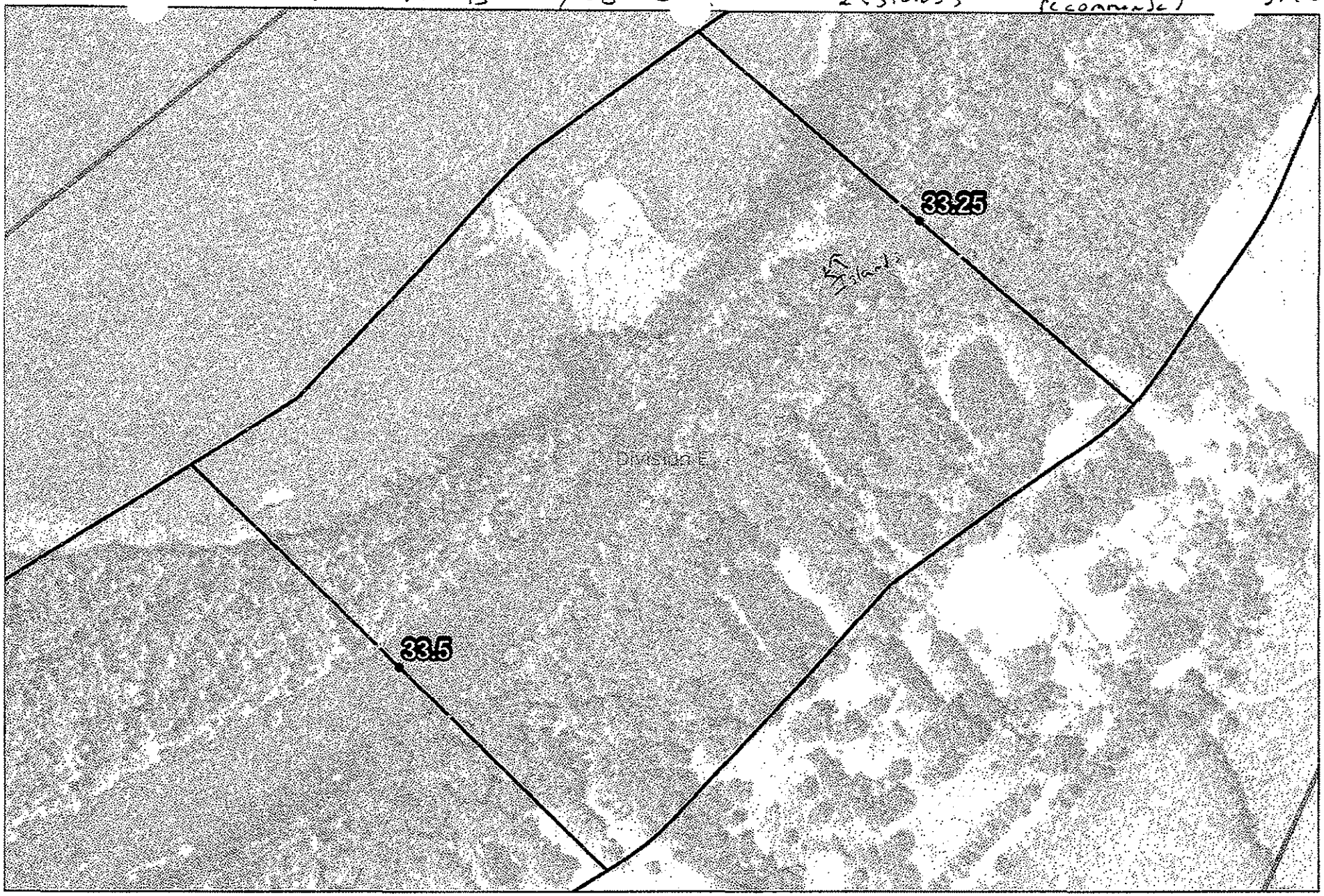
0 75 150
Feet

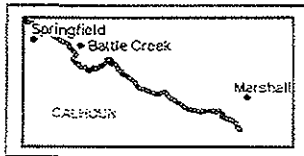
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team 4 #33.5 KDB No 0! 2 islands No Action recommended @ 3.10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

33.25-33.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 333 **to MP** 335 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAUK	9-1-10 (date)	Enbridge
MJ Nalipinski MJ NALIPINSKI	1 Sept 10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Liew	09/05/2010 (date)	Enbridge	Pamela E Rice 9/5/10 Pamela E. RICE
Gary A. Ambler Gary A. Ambler	9.5.10 (date)	EPA	Michelle Kerr 09.05.10 MICHELLE KERR
Kenneth M. Mroczkowski Kenneth M. Mroczkowski	09/05/2010 (date)	MDNRE	9-5-2010 Rachel MATTHEWS

5. **EPA**

Signature GARY LIPSON	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 33.50



Photo 0297 – Looking southeast at left descending bank.



Photo 0298 – Looking west at right descending bank.

Field Photo Log – Segment MP 33.50

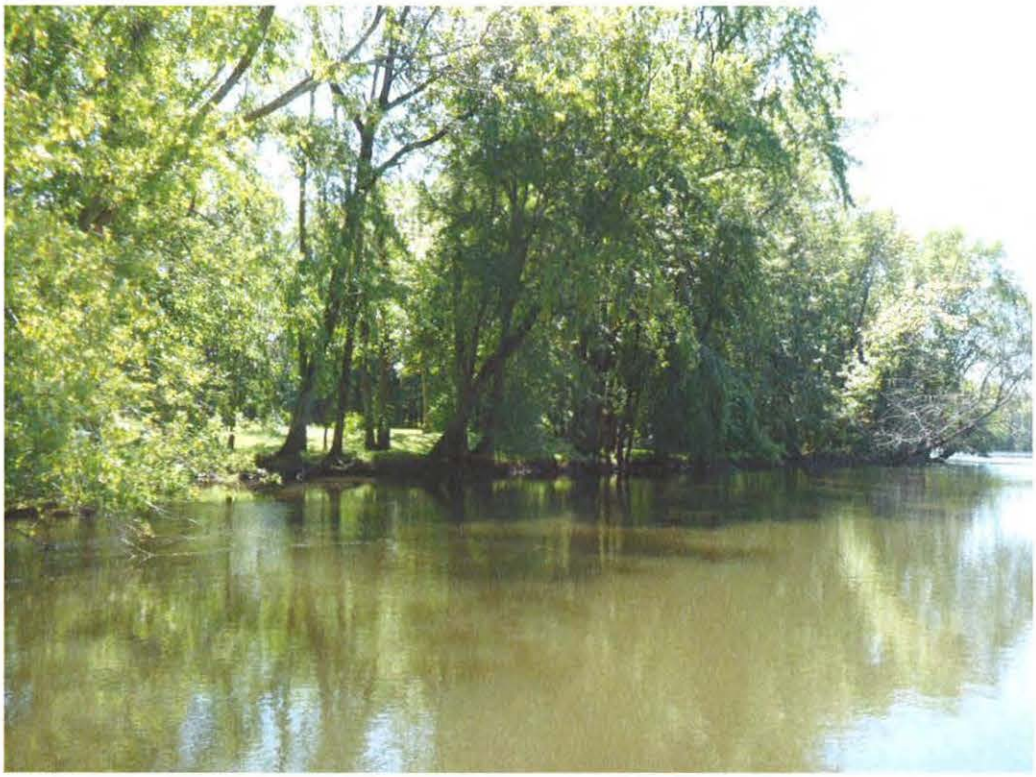


Photo 0299 – Looking southwest at left descending bank.



Photo 0300 – Looking southwest at right descending bank.

Field Photo Log – Segment MP 33.50



Photo 0301 – Looking south at left descending bank.



Photo 0302 – Looking west at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 33.75 – MP 33.5 to 33.75

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 33.75 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and no islands were present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 33.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

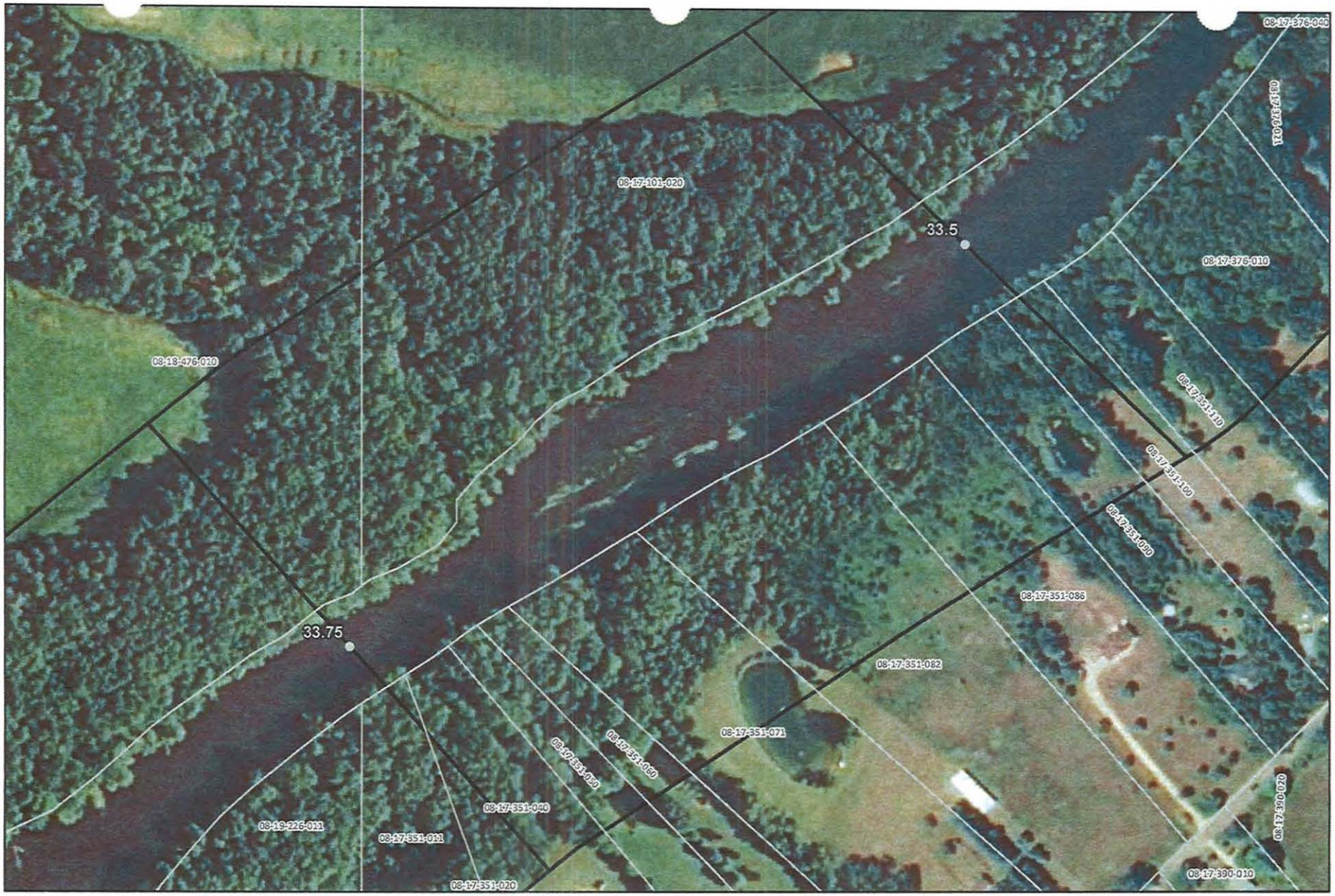
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 33.5-33.75 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 33.5-33.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

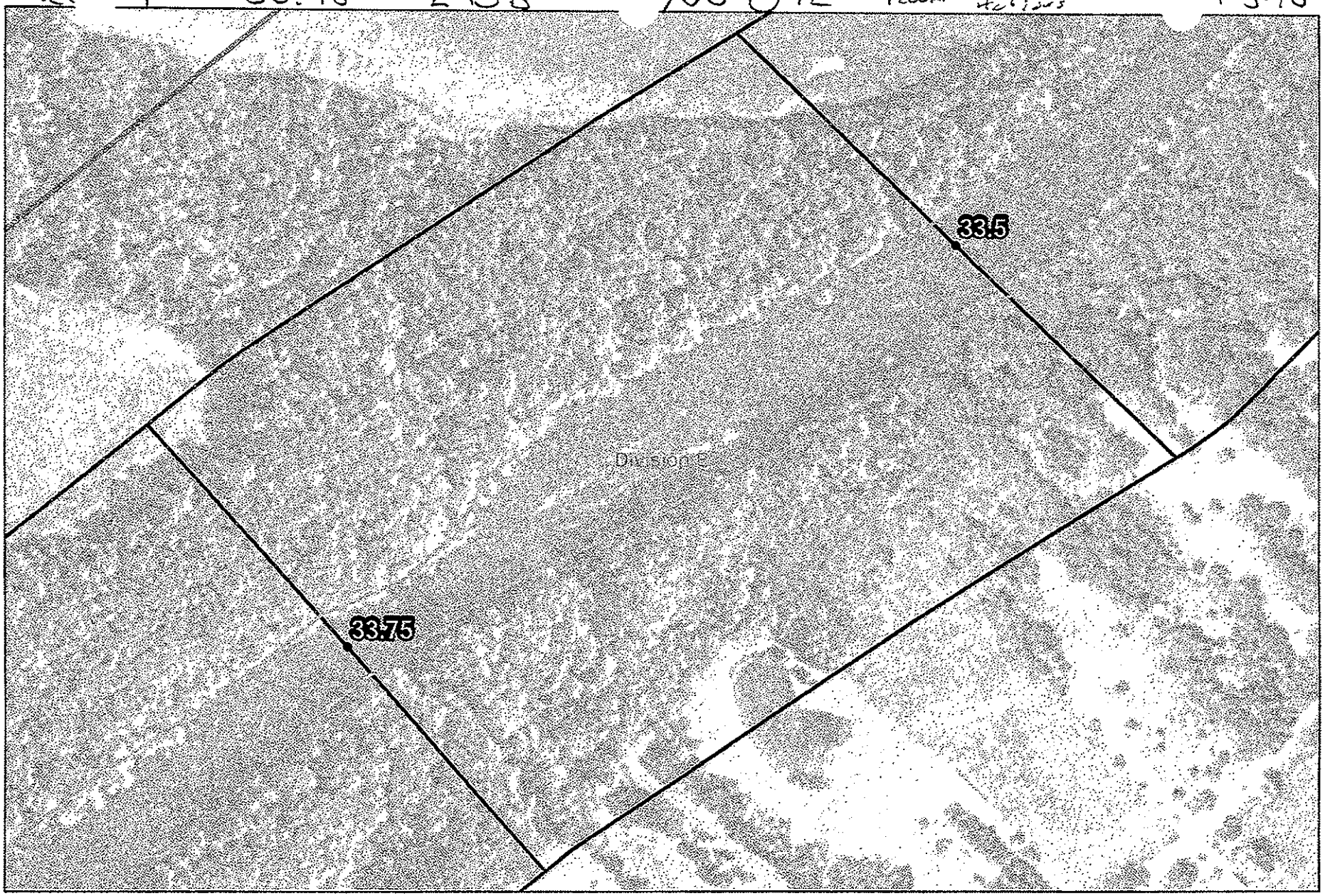
0 75 150 Feet

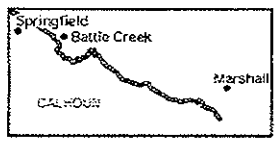
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Tec 4 #33.75 LDB NO OIL No recommendations 9-3-10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

33.5-33.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

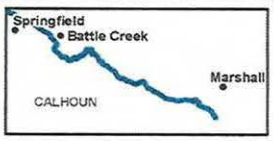
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 33.5-33.75 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 33.5-33.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

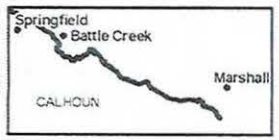
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





- Quarter Mile Segment
- Divisions
- Shoreline
- River_QuarterMiles

Team 3 9-3-2010
33.5-33.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From**_____ **Start MP to End MP**_____ **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 33.5 **to MP** 33.75 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAUX	9-1-10 (date)	Enbridge
Signature MJ NALEPINSKI	1 Sept 10 (date)	EPA

4. **SCAT Reassessment**

Signature Pamela E. Rice	9-5-10 (date)	Enbridge
Signature MICHELLE KERR	09.05.10 (date)	EPA
Signature Rachel Matthews	9-5-2010 (date)	MDNRE

5. **EPA**

Signature GARY LIPSON	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

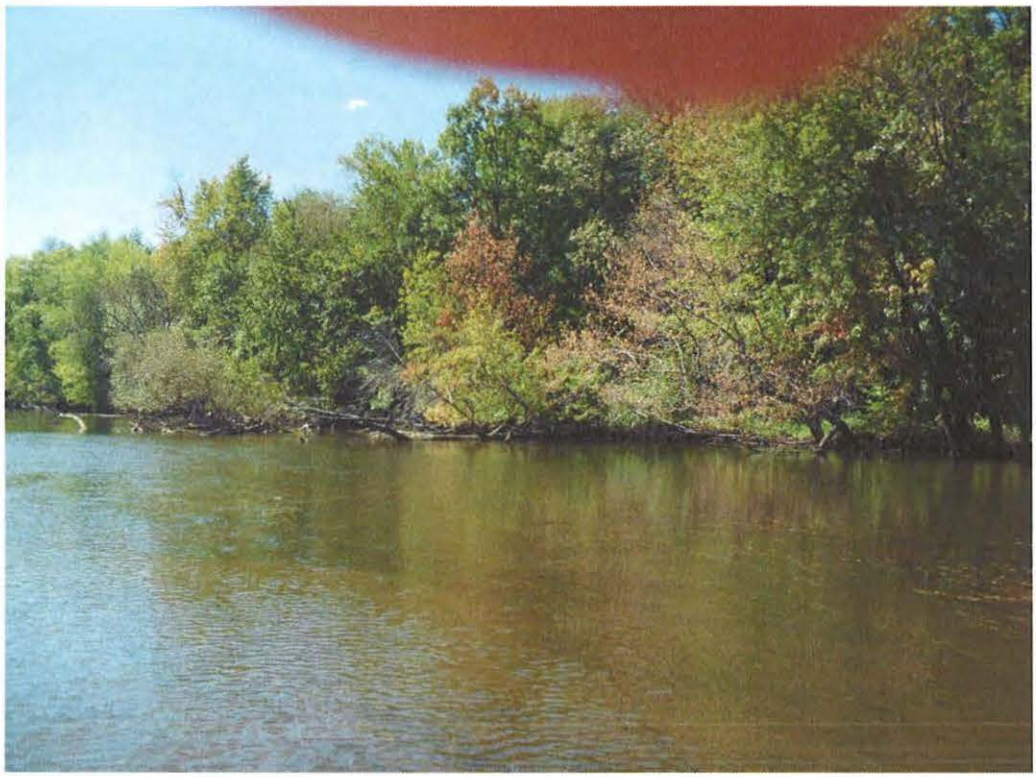


Photo 0303 – Looking south at right descending bank.



Photo 0304 – Looking west at left descending bank.



Photo 0305 – Looking south at left descending bank.

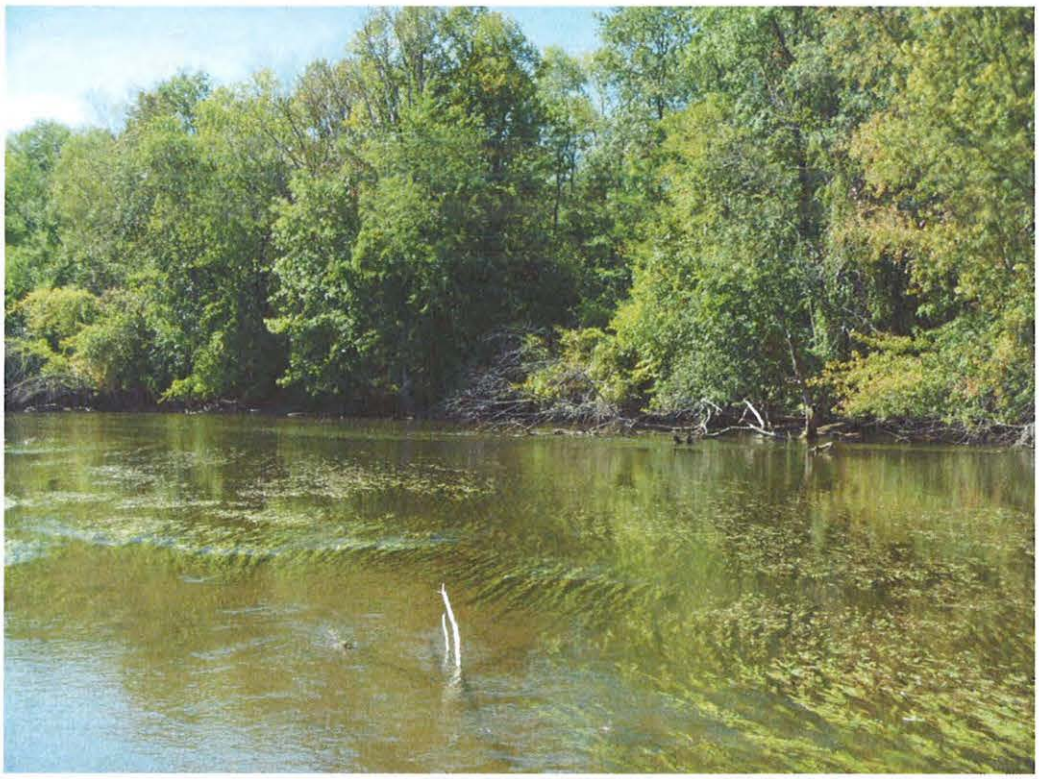


Photo 0306 – Looking west at right descending bank.



Photo 0307 – Looking south at left descending bank.



Photo 0308 – Looking northwest at right descending bank.



Photo 0309 – Looking west at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 34.00 – MP 33.75 to 34.00

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 34.00 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and no islands were present. There were no problematic areas that required special consideration.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 34.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Doeumentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

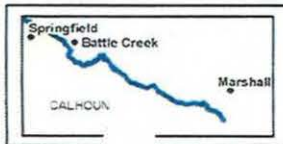
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... ...t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 33.75-34.0 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 33.75-34
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

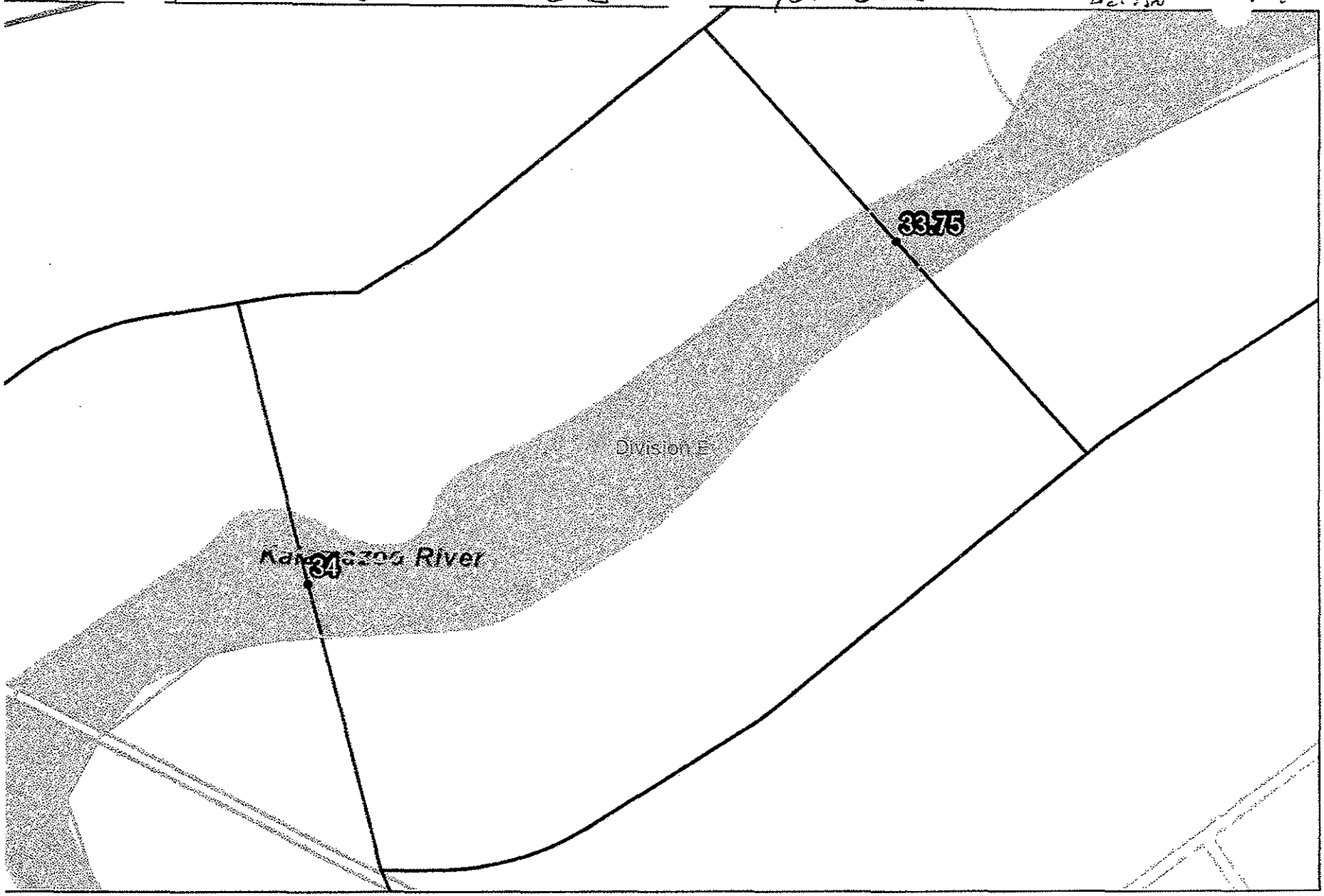
Source: Aerial Photography: USDA, 2009.

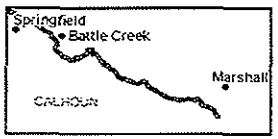
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan Feet

Team 4 # 34.0 LDB No Oil No recommended Action @ T:10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

33.75-34

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

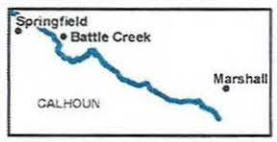
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 33.75-34.0 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 33.75-34
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

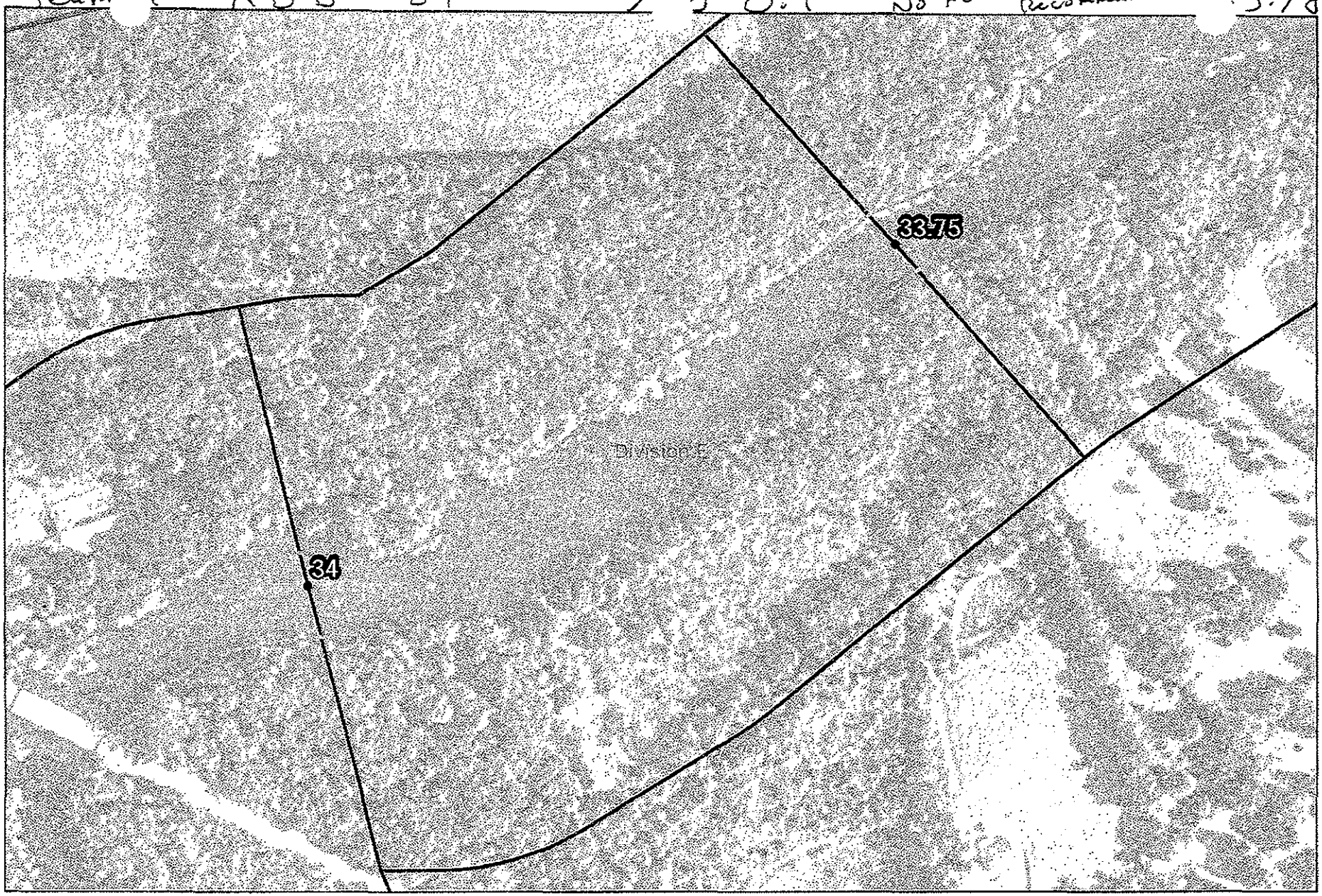
0 75 150
Feet

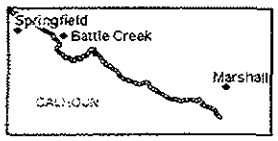
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team 1 RDB #34 1/2 Oil No Action Recommended 7.3.10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

33.75-34

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor) _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 33.75 **to MP** 34.0 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAUX	9-1-10 (date)	Enbridge
Signature M J NIKLIPINSKI	1 Sept 10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Loan	09/05/2010 (date)	Enbridge
Signature Gary A. Andrew	9.5.10 (date)	EPA
Signature Kenneth M. Mroczkowski	09/05/2010 (date)	MDNRE

5. **EPA**

Signature GARY LIPSON	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0310 – Looking south at left descending bank.



Photo 0311 – Looking west at right descending bank.



Photo 0312 – Looking west at right descending bank.



Photo 0313 – Looking southwest at left descending bank.



Photo 0314 – Looking southeast at left descending bank.



Photo 0315 – Looking northwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 34.25 – MP 34.00 to 34.25

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 34.25 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations:

Outcome

No oiled conditions exist. Segment 34.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

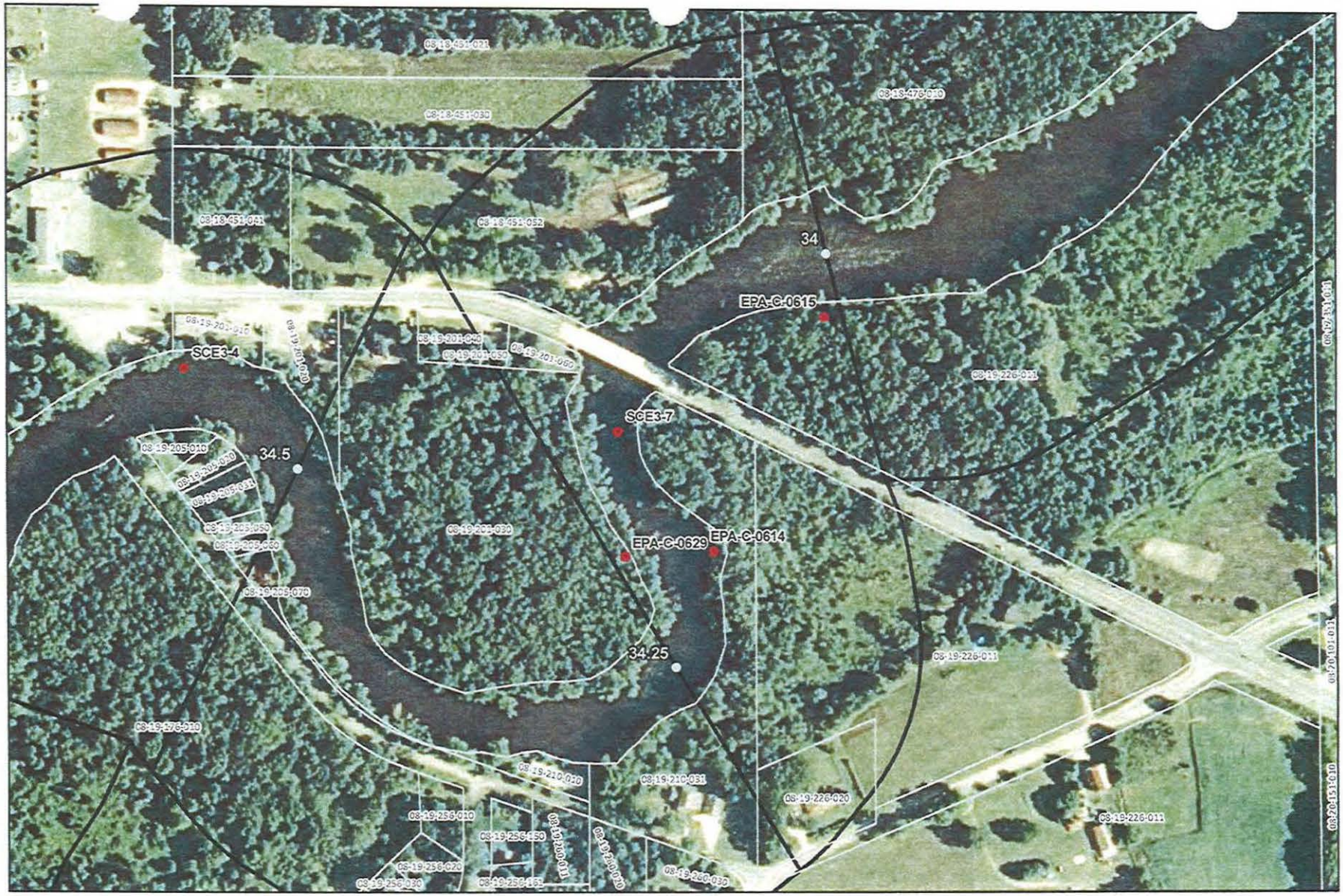
Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

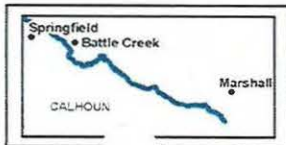
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 34.0-34.25 Left Bank While Looking Downstream										
SCE3-7	Bridge	SCAT T1 08/08/2010	No recommendations provided. Reference location at Michigan St. Bridge.					No cleanup recommendations.	42.28815	-85.40175
EPA-C-0615	Channel	SCAT T5 09/02/2010	no oiled conditions observed reference point only; no oiled conditions; no actions needed					No actions needed.	42.28891	-85.39998
EPA-C-0614	Channel	SCAT T5 09/02/2010	no oiled conditions-reference point only; no oiled conditions observed					No actions needed.	42.28740	-85.40091





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Division E: Mile Marker 34-34.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

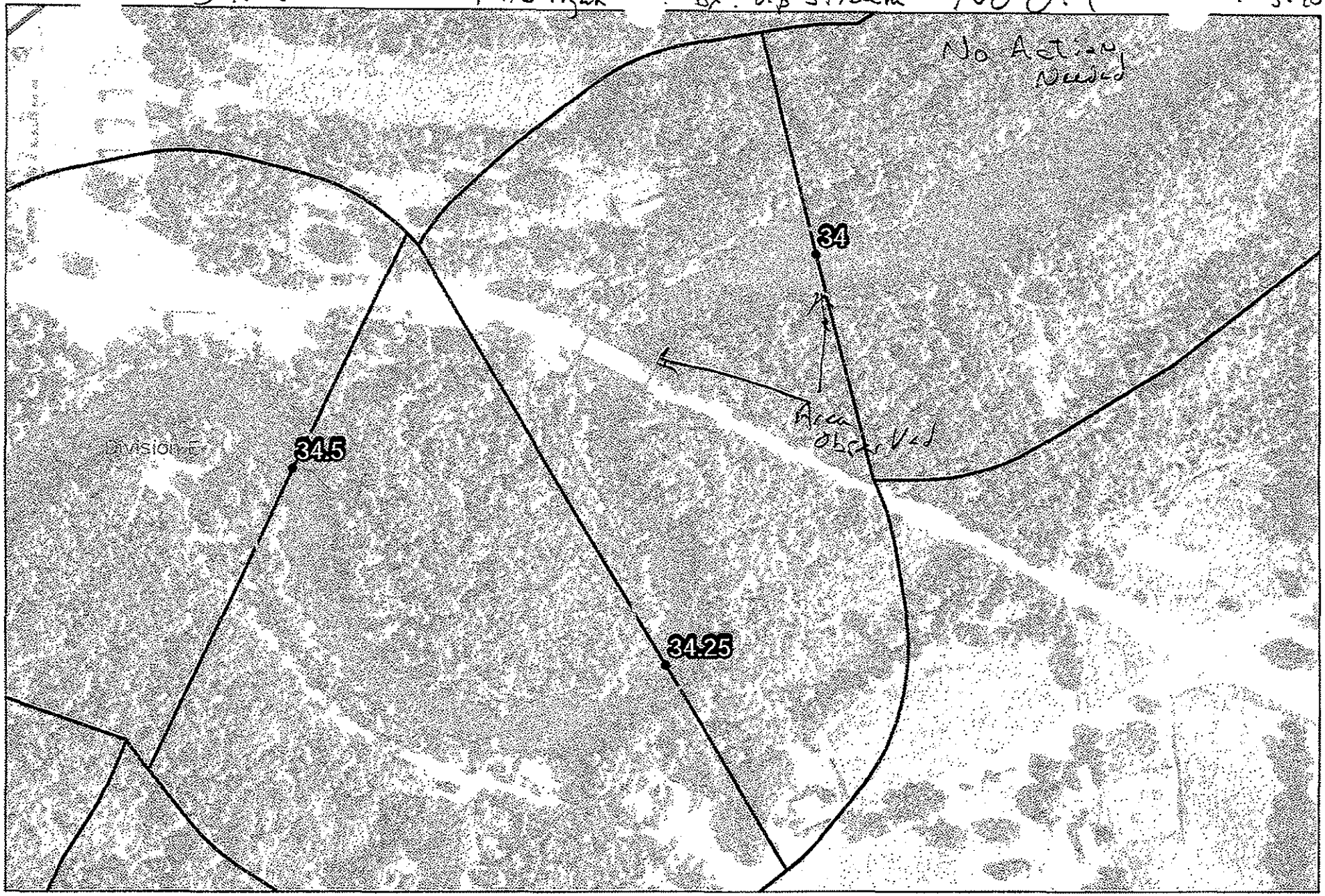
0 75 150
Feet

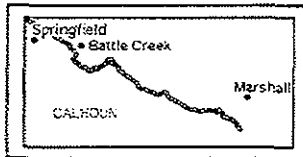
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team 11 #34.25 LDB Michigan Br. Up stream NO 0:1 9.3.10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

34-34.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

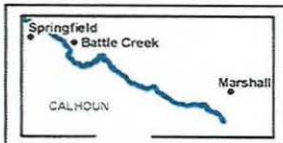
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 34.0-34.25 Right Bank While Looking Downstream										
EPA-C-0629	Channel	SCAT T? 09/01/2010	Light sheen observed near RDB and possibly in sediment. No observed oil on shore. No clean-up recs for this segment.						42.28736	-85.40167





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 34-34.25
Right Bank While Looking Downstream

Enbridge Pr... Release Incident - Kalamazoo River Oil Spill

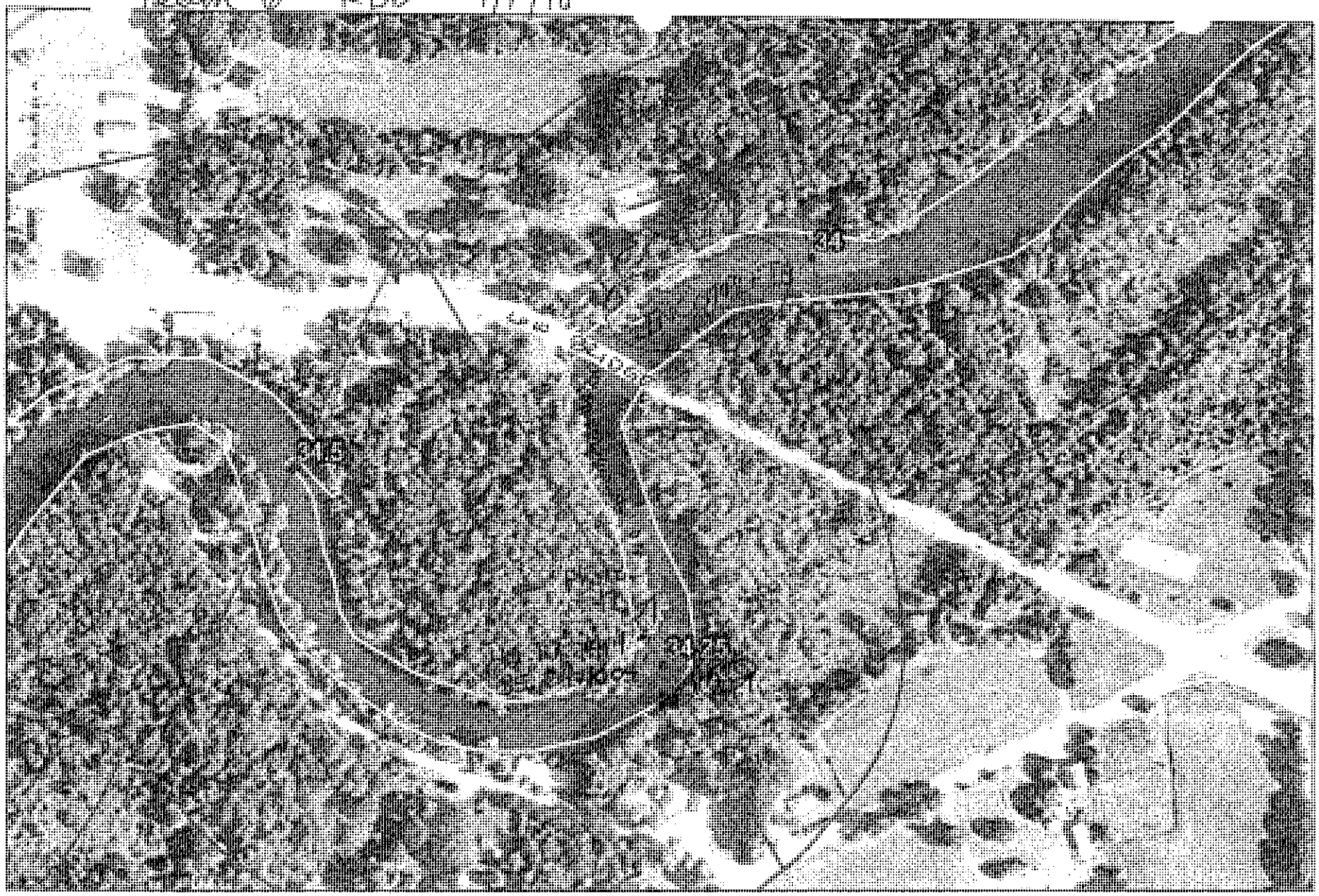
0 75 150
Feet

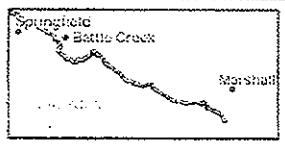
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Mich... ft Feet

Team 6 RDB 9/1/10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

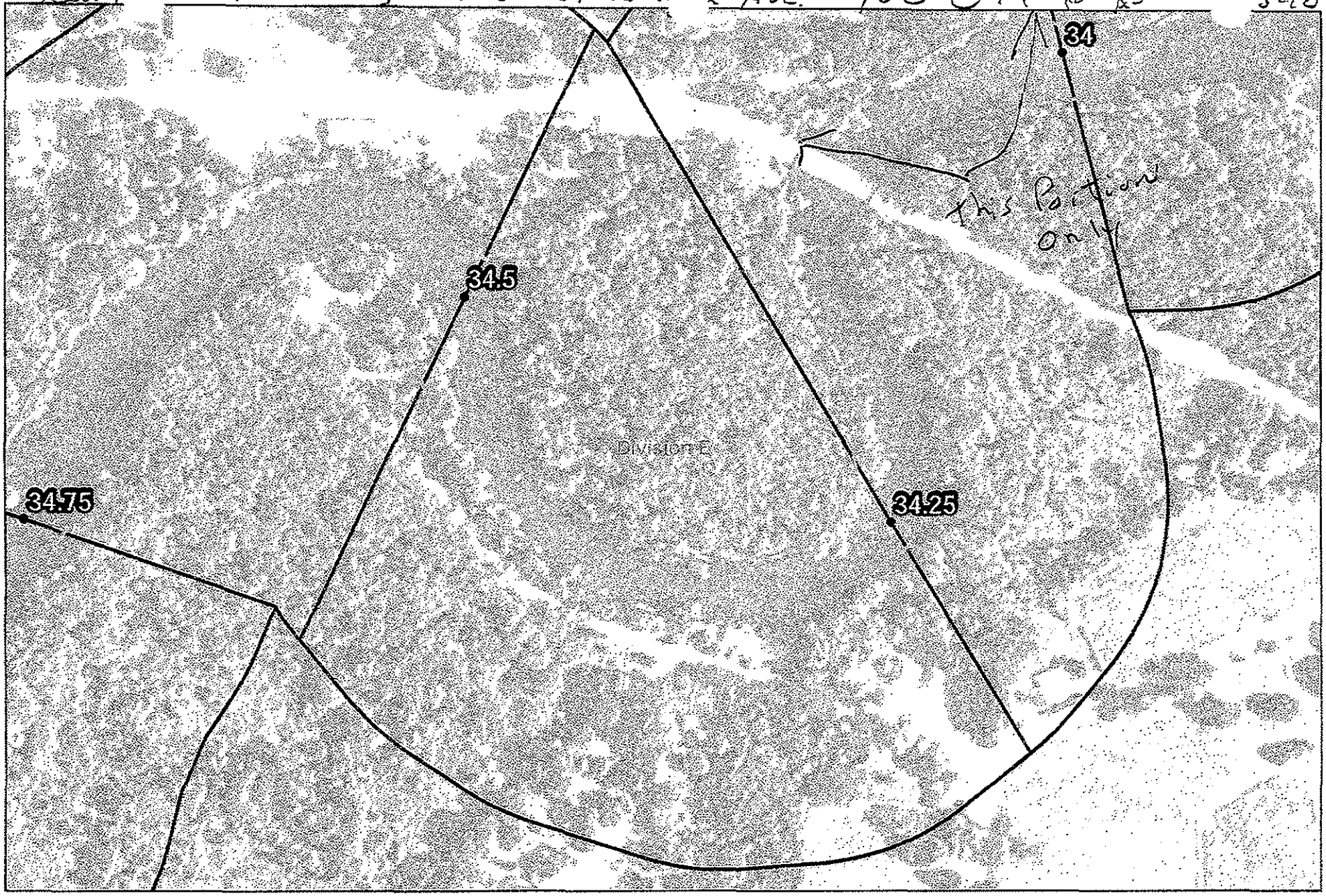
34-34.25

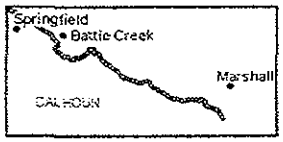
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography USDA 2009

ENTRIX





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

34.25-34.5

Enbridge Pipeline Release incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South, Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 34.0 **to MP** 34.25 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUX	9-1-10 (date)	Enbridge	Michael A. Zamoetis 9/15/10
Signature MJ NALEPINSKI	1 Sept '10 (date)	EPA	

4. **SCAT Reassessment**

Signature Michael Van Loan	09/05/2010 (date)	Enbridge	
Signature WILLIAM BATES	9/5/10 (date)	EPA	Gary A. Andrew 9.5.10
Signature Kenneth M. Mroczkowski	09/05/2010 (date)	MDNRE	SARAH VANDERZIEL 9/8/10

5. **EPA**

Signature GARY LIPSON	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0326 – Looking northeast at left descending bank



Photo 0327 – Looking west at right descending bank.



Photo 0328 – Looking southwest at right descending bank.

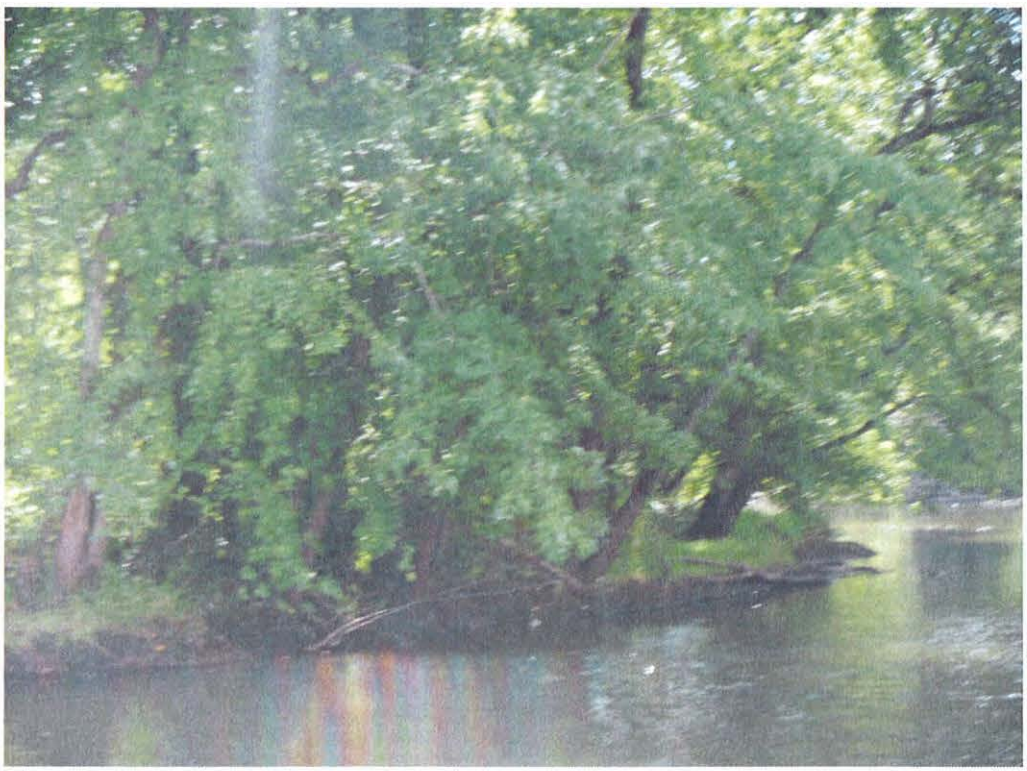


Photo 0329 – Looking south at left descending bank near SCE3-7.

Field Photo Log – Segment MP 34.25

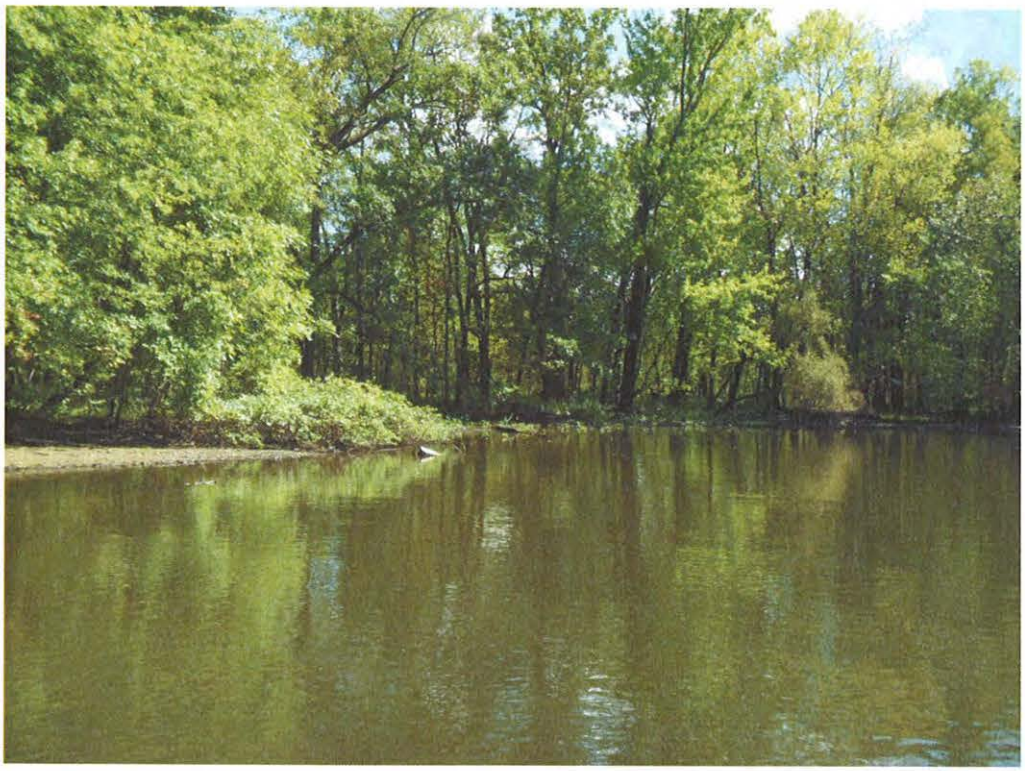


Photo 0330 – Looking southeast at left descending bank near EPA-C-0614



Photo 0331 – Looking.south at right descending bank near EPA-C-0629.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 34.50 – MP 34.25 to 34.50

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 34.50 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations:

Outcome

No oiled conditions exist. Segment 34.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

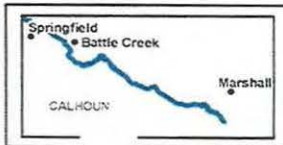
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 34.25-34.5 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 34.25-34.5
Left Bank While Looking Downstream

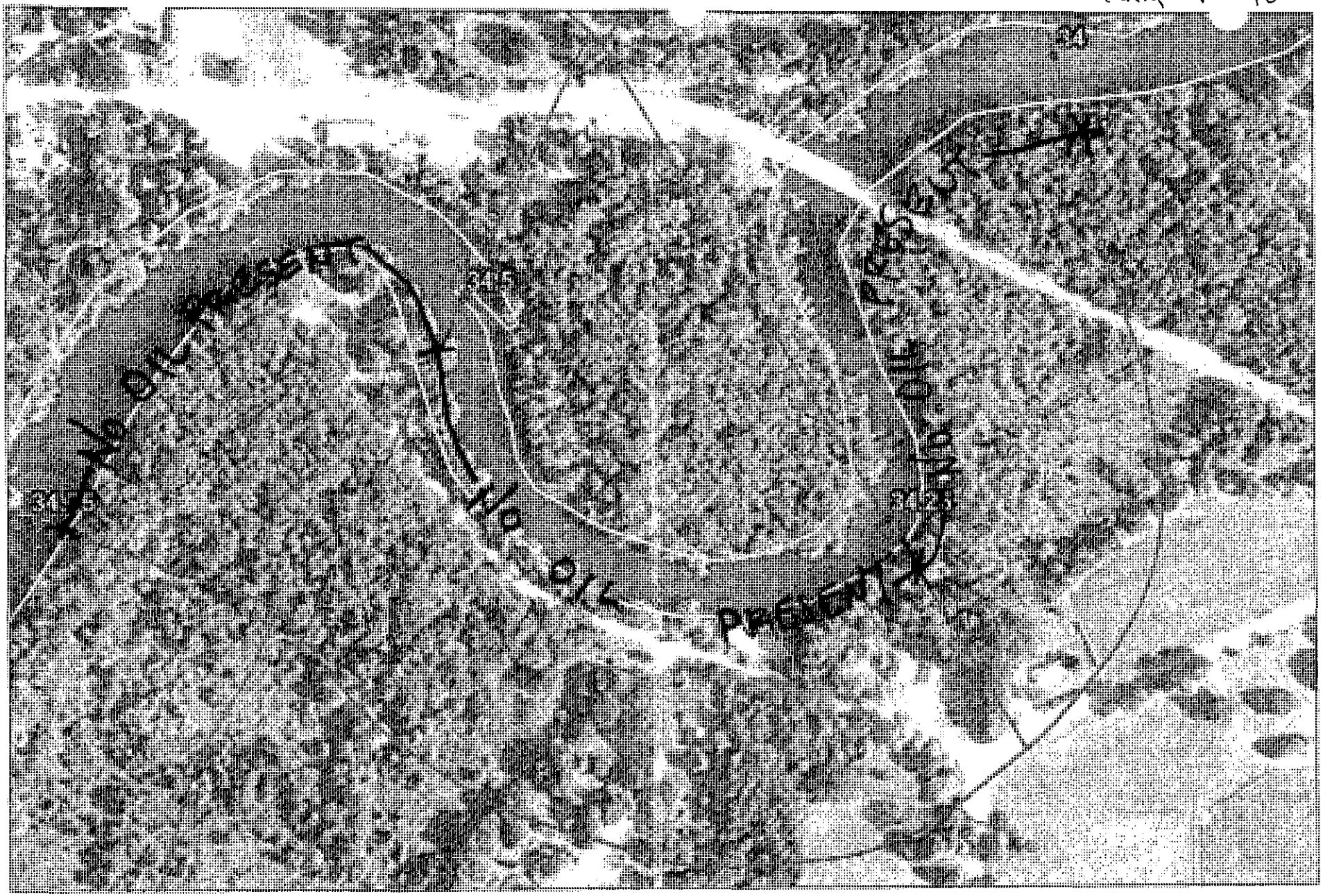
Enbridge [illegible]ine Release Incident - Kalamazoo River Oil Spill

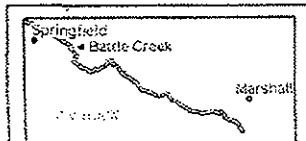
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Mi[illegible] South Feet

TEAM 9:410





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

34.25-34.5

Enbridge Pipeline Release Incident Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography USDA, 2009

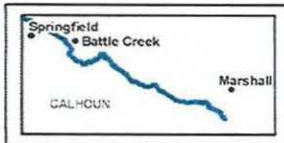
ENTRIX

Enbridge Pipeline Release In. it - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 34.25-34.5 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 34.25-34.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team 6 LDB 7/1/10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

Photo 46 + 47 Airboat
34.25-34.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography USDA, 2009

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor):

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 34.25 **to MP** 34.5 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

9-1-10 — Enbridge
Signature CHRISTOPHER HAUK (date)

M J Nalepinski / Sgt '10 — EPA — Stephen L. Ball 9/5/10
Signature (date)
M J NALEPINSKI

4. **SCAT Reassessment**

M A. Zamberi 9/5/10 — Enbridge — Jack W. Boss 9/5/10
Signature MICHAEL A. ZAMBERI (date)

9/5/10 — EPA
Signature WILLIAM BATES (date)

Debora Snell 9/6/10 — MDNRE — SARAH VANDEZEZIJL 9/8/10
Signature Debora Snell (date)

5. **EPA**

9/14/10 — EPA Division Supervisor
Signature (date)
GARY LIPSON

Appendix E
Photos

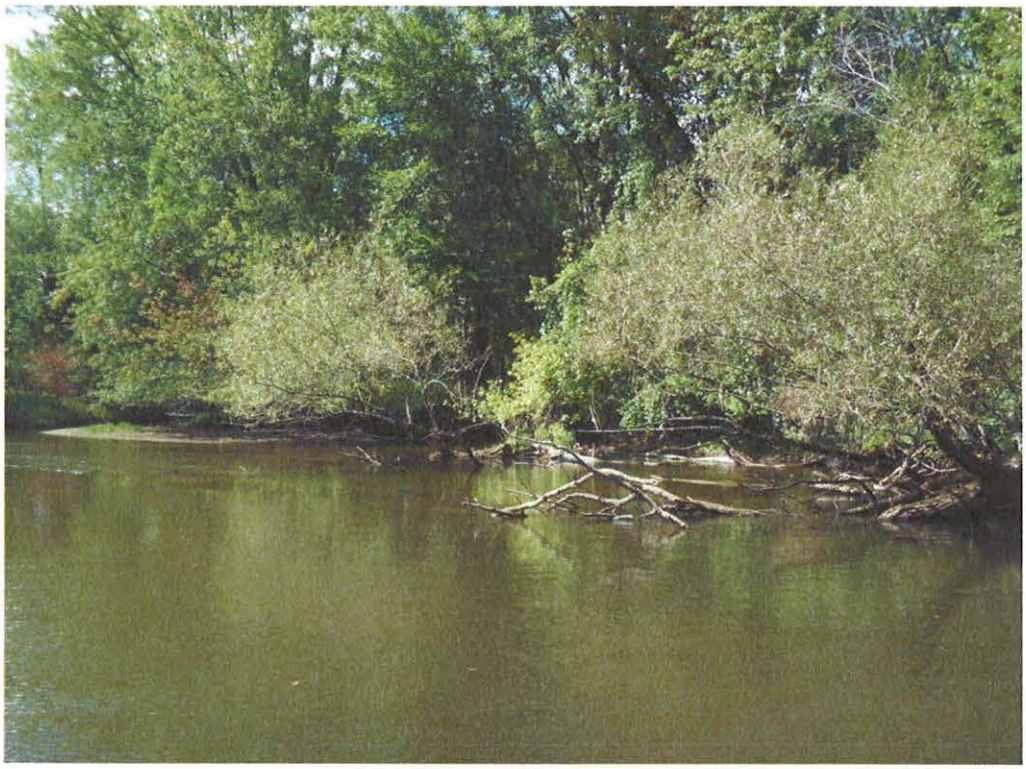


Photo 0332 – Looking west at right descending bank.

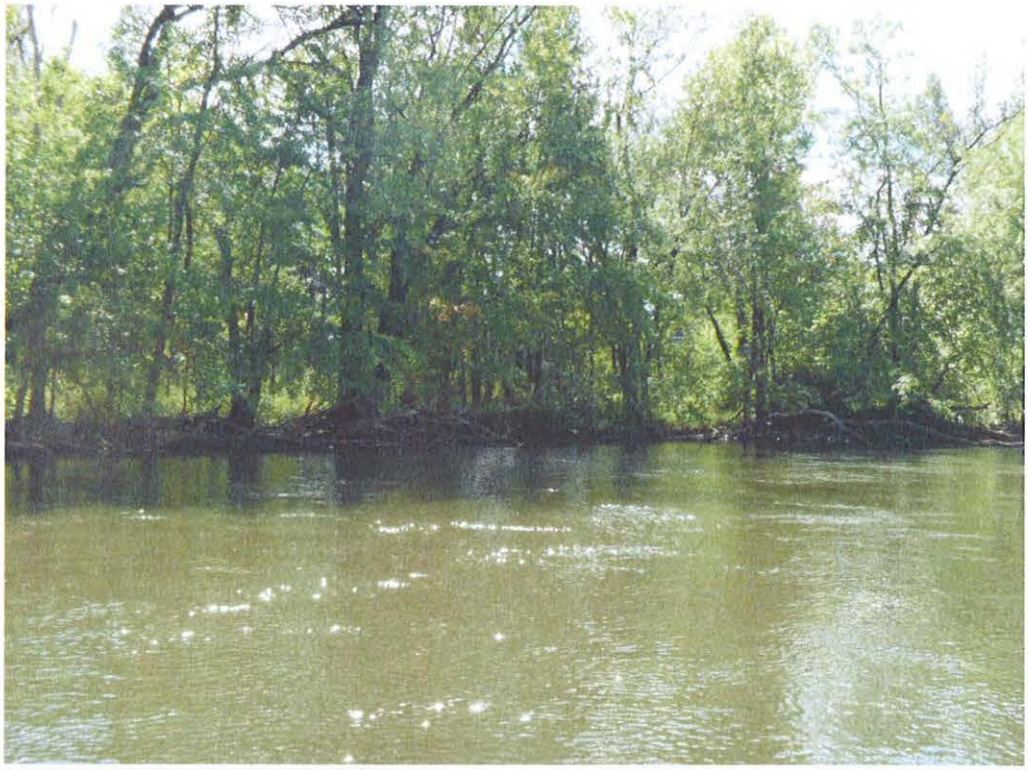


Photo 0333 – Looking southwest at left descending bank.

Field Photo Log – Segment MP 34.50



Photo 0334 – Looking southwest at left descending bank.



Photo 0335 – Looking west at right descending bank.

Field Photo Log – Segment MP 34.50

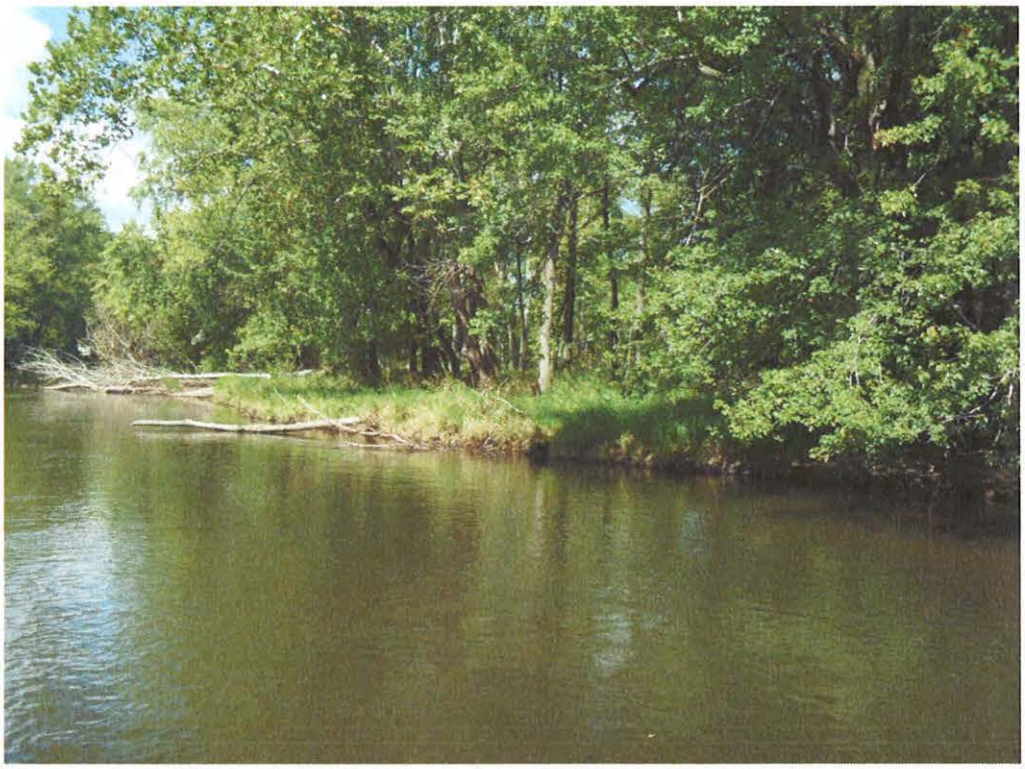


Photo 0336 – Looking northwest at right descending bank.



Photo 0337 – Looking southwest at left descending bank.

Field Photo Log – Segment MP 34.50



Photo 0338 – Looking west at left descending bank.



Photo 0339 – Looking north at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 34.75 – MP 34.50 to 34.75

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 34.75 had no oiling observed on the left or right descending banks. The overbank contained no areas requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 34.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

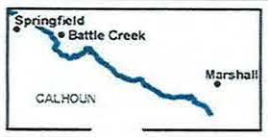
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In. nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 34.5-34.75 Left Bank While Looking Downstream										
EPA-C-0612	Channel	SCAT T5 09/02/2010	End of quarter mile no oiled conditions; nooiled conditions observed					No actions needed.	42.28685	-86.40725





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 34.5-34.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michi[illegible]n Feet

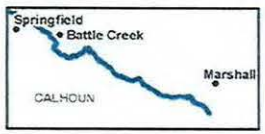

Springfield
Battle Creek
Marshall
Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles
34.5-34.75
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill
0 75 150
Feet
Source: Aerial Photography, USDA, 2009
ENTRIX

Enbridge Pipeline Release In. .it - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 34.5-34.75 Right Bank While Looking Downstream										
EPA-C-0628	Channel	SCAT T? 09/01/2010	No clean-up recs for this segment.					No actions needed.	42.28704	-85.40773





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 34.5-34.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Tec 6 RDB 9/1/10



Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 34.50 Start MP to End MP 34.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From** 34.50 **Start MP to End MP** 34.75 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION **Operations Division:** E **Segment ID: From MP** 34.5 **to MP** 34.75 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

[signature] 9/10/10 Enbridge
Signature CHRISTOPHER HAUX (date)

[signature] 9/10/10 EPA
Signature (date)

4. **SCAT Reassessment**

Glenn Vande Water 9/13/2010 Enbridge
Signature Glenn Vande Water (date)

Dana Strouse 9/13/10 ~~EPA~~ MDNRE
Signature Dana Strouse (date)

Ross del Rosario 9/13/10 ~~MDNRE~~ EPA
Signature ROSS DEL ROSARIO (date)

5. **EPA**

[signature] 9/18/10 EPA Division Supervisor
Signature GARY LIPSON (date)

Appendix E
Photographs

Field Photo Log – Segment MP 34.75



Photo 0340 – Looking north at right descending bank.



Photo 0341 – Looking west at left descending bank.

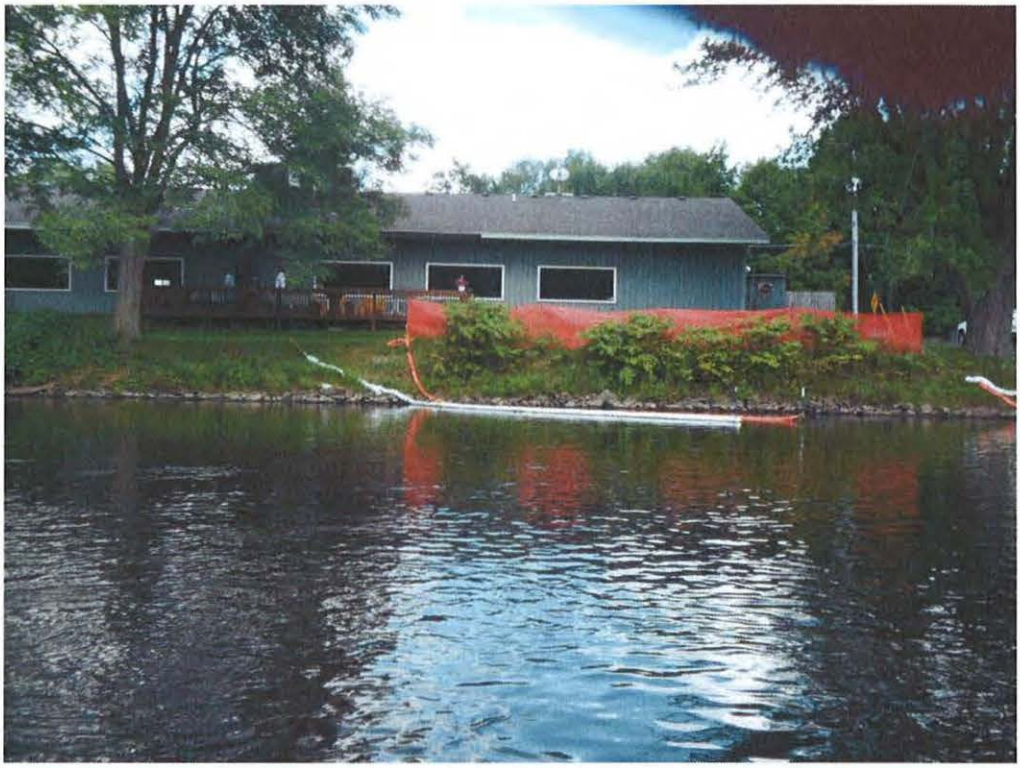


Photo 0342 – Looking north at right descending bank. Near SCE3-4.

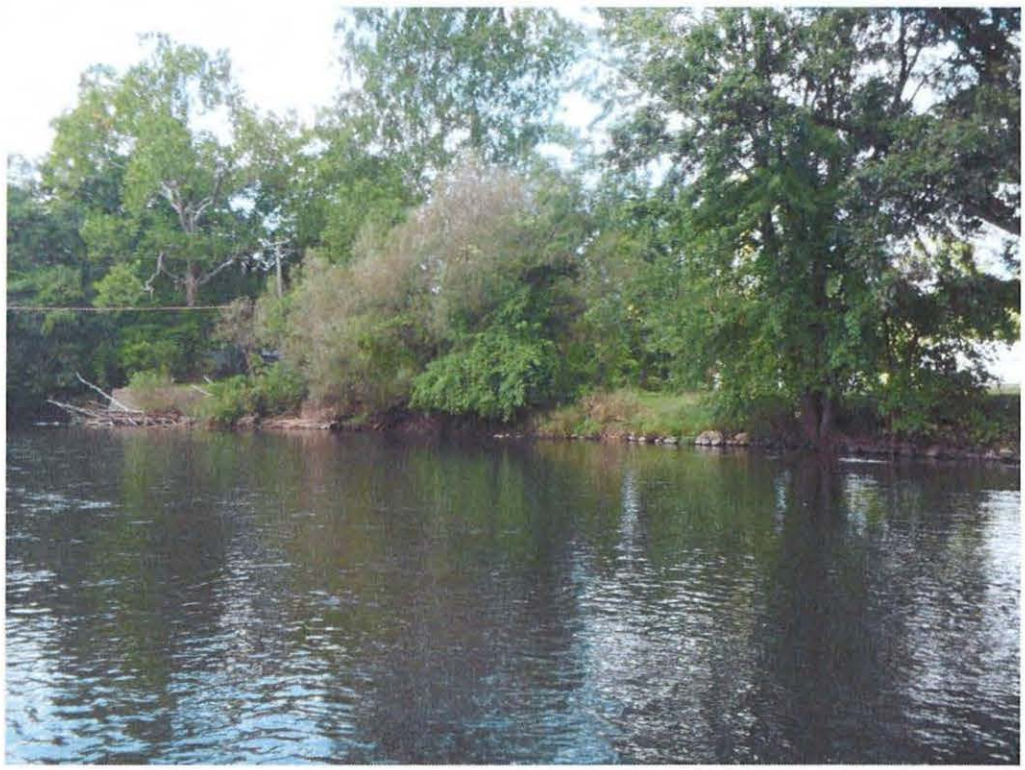


Photo 0343 – Looking west at right descending bank.

Field Photo Log – Segment MP 34.75



Photo 0344 – Looking southwest at left descending bank.

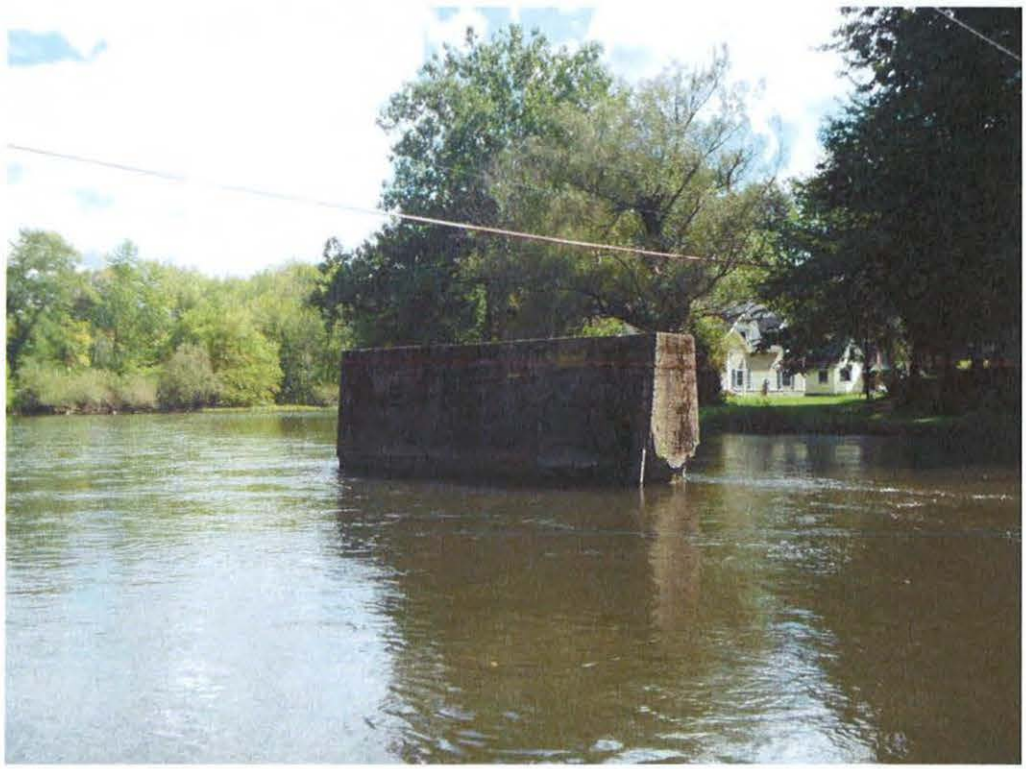


Photo 0345 – Looking northeast at left descending bank.



Photo 0346 – Looking southwest at right descending bank.



Photo 0347 – Looking south at left descending bank.

Field Photo Log – Segment MP 34.75



Photo 0348 – Looking southwest at right descending bank. Near EPA-C-0628.



Photo 0349 – Looking south at left descending bank. Near EPA-C-0612.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 35.00 – MP 34.75 to 35.00

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 35.00 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

No oiled conditions exist. Segment 35.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

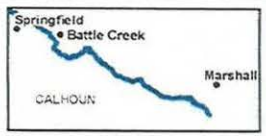
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Ir. nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 34.75-35.0 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 34.75-35
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

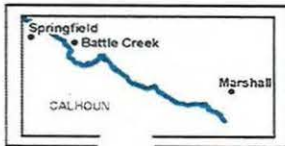

Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles
34.75-35
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill
0 75 150
Source: Aerial Photography: USDA, 2009.
ENTRIX

Enbridge Pipeline Release In... ...t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 34.75-35.0 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 34.75-35
Right Bank While Looking Downstream

Enbridge Pip[illegible]e Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Mich[illegible] th Feet


Springfield
Battle Creek
Marshall
Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles
34.75-35
Enbridge Inc
Release Incident - Kalamazoo River Oil Spill
0 75 150
Feet
Source: Aerial Photography: USDA, 2009.
ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 34.75 **to MP** 35.00 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK	8-31-10 (date)	Enbridge
Signature M J NALIPINSKI	31 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBRANO	9/5/10 (date)	Enbridge Jack W. Boss 9/5/10
Signature WILLIAM BATES	9/5/10 (date)	EPA Stephen Ball 9/5/10
Signature Debora Snell	9/6/10 (date)	MDNRE SARAH VANDELEZIJC 9/8/10

5. **EPA**

Signature GARY LIPSON	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 35.00



Photo 0350 – Looking southwest at right descending bank.



Photo 0351 – Looking south at left descending bank.

Field Photo Log – Segment MP 35.00



Photo 0352 – Looking southwest at right descending bank.

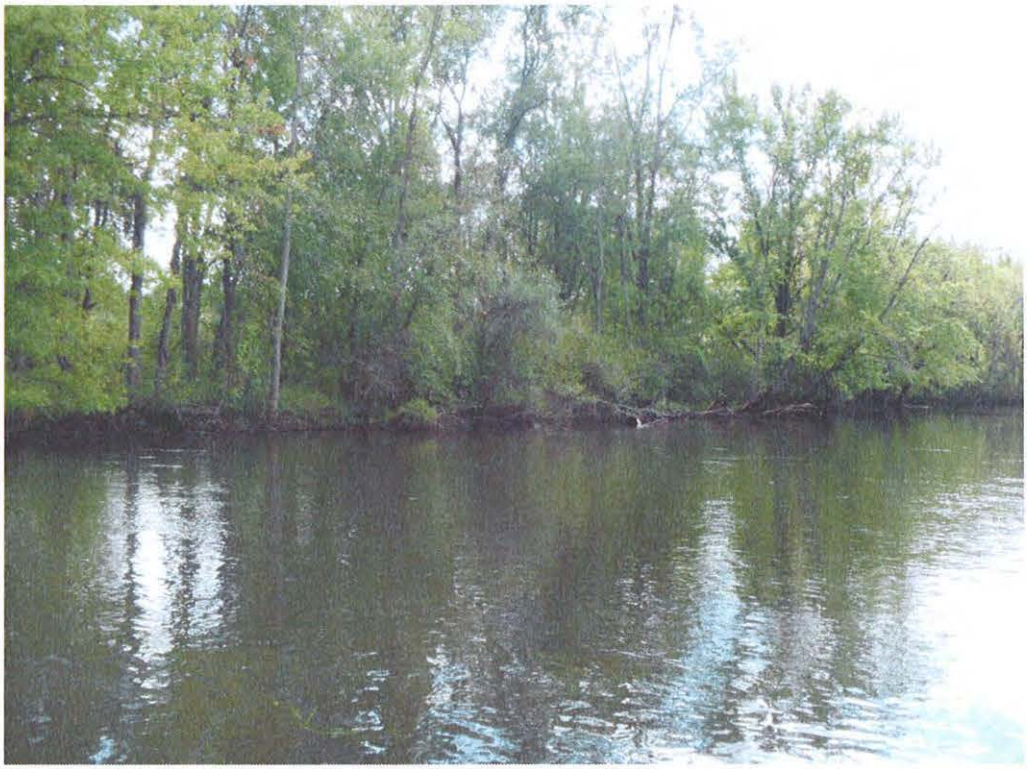


Photo 0353 – Looking south at left descending bank

Field Photo Log – Segment MP 35.00



Photo 0354 – Looking southeast at left descending bank.



Photo 0355 – Looking south at left descending bank

Field Photo Log – Segment MP 35.00



Photo 0356 – Looking southwest at right descending bank.



Photo 0357 – Looking south at left descending bank.

Field Photo Log – Segment MP 35.00



Photo 0358 – Looking southwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 35.25 – MP 35.0 to 35.25

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 35.25 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that require special attention.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 35.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 35.0-35.25 Left Bank While Looking Downstream										
SCE3-6	Shoreline	Shoreline Assessment					(Current?) aerators at E-3 are good. No specific recommendations provided except "need mop."	Need mop.	42.28462	-85.41462





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 35-35.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

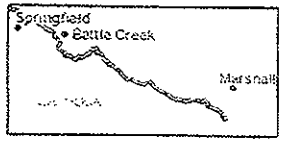
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

35-35.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

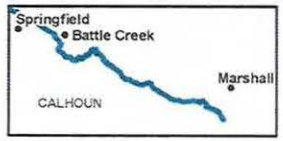
Source: Aerial Photography: USDA, 2009.

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 35.0-35.25 Right Bank While Looking Downstream										
SCE3-3	Shoreline	Shoreline Assessment					No recommendations provided.	No recommendations provided.	42.284133	-85.41185
EPA-C-0627	Channel	SCAT T? 09/01/2010	GPS coordinates are in degrees minutes due to no team GPS provided. 42.17.0514 = 42 degrees 17.0514' 85.24.6585 = 85 degrees 24.6585 No clean-up recs for this segment.					No actions needed.	42.28419	-85.41098





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 35-35.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

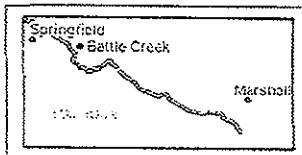
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

35-35.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 35.00 **to MP** 35.25 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK	8-31-10 (date)	Enbridge
Signature MJ NALIPINSKI	31 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBETTI	9/5/10 (date)	Enbridge Jack W. Boss 9/5/10
Signature WILLIAM BATES	9/5/10 (date)	EPA Stephen Ball 9/5/10
Signature Debora Snell	9/6/10 (date)	MDNRE SARAH VANDERZIJL 9/8/10

5. **EPA**

Signature GARY LIPSON	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 35.25



Photo 0359 – Looking northwest at right descending bank near EPA-C-0627.



Photo 0360 – Looking southwest at left descending bank.



Photo 0361 – Looking north at right descending bank near SCE3-2.

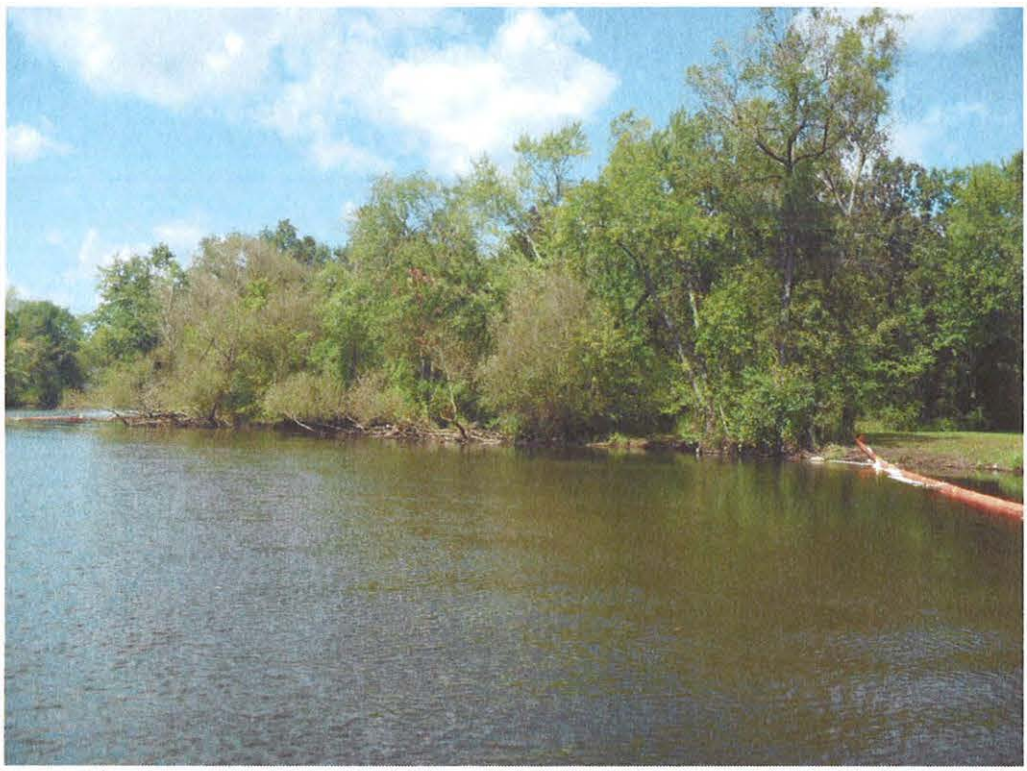


Photo 0362 – Looking southwest at right descending bank.



Photo 0363 – Looking south at left descending bank.



Photo 0364 – Looking south at left descending bank near SCE3-6.



Photo 0365 – Looking southwest at right descending bank.



Photo 0366 – Looking southwest at left descending bank near EPA-C-0618.

Field Photo Log – Segment MP 35.25



Photo 0367 – Looking north at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 35.50 – MP 35.25 to 35.5

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 35.50 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that require special attention.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 35.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
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TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
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NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
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PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

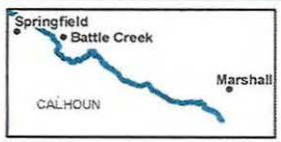
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 35.25-35.5 Left Bank While Looking Downstream										
EPA-C-0616	Channel	SCAT T? 09/01/2010	No Oil observed ref only; No oil conditions						42.28473	-85.41547





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 35.25-35.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

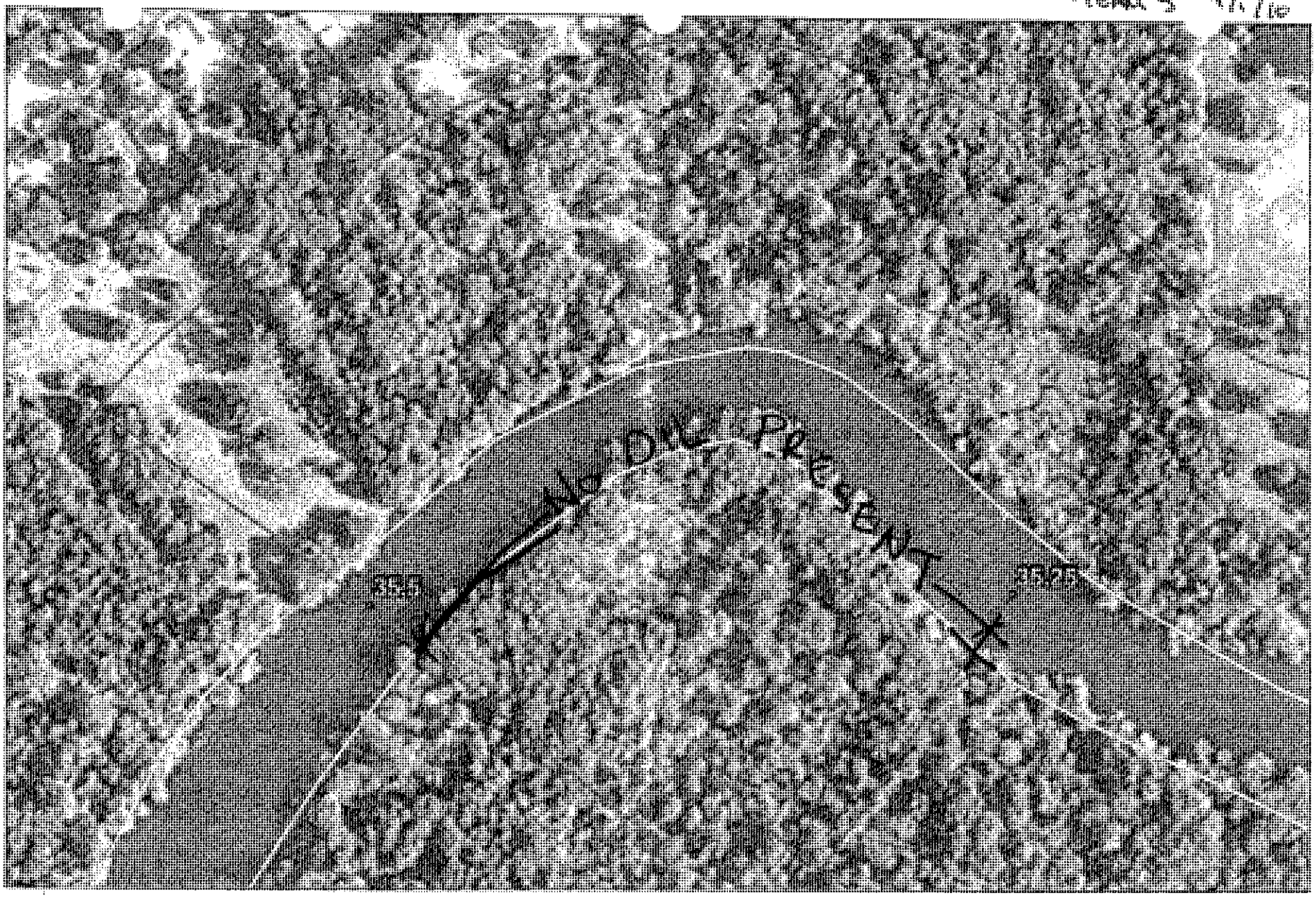
0 75 150
Feet

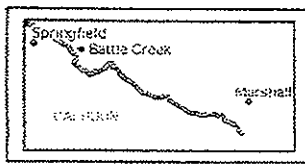
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TEAM 5 9/1/10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

35.25-35.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography USDA, 2009

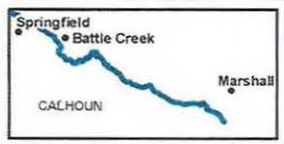
ENTRIX

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 35.25-35.5 Right Bank While Looking Downstream										
EPA-C-0627	Channel	SCAT T? 09/01/2010	GPS coordinates are in degrees minutes due to no team GPS provided. 42.17.0514 = 42 degrees 17.0514' 85.24.6585 = 85 degrees 24.6585					No further action required.	42.28419	-85.41098





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 35.25-35.5
Right Bank While Looking Downstream

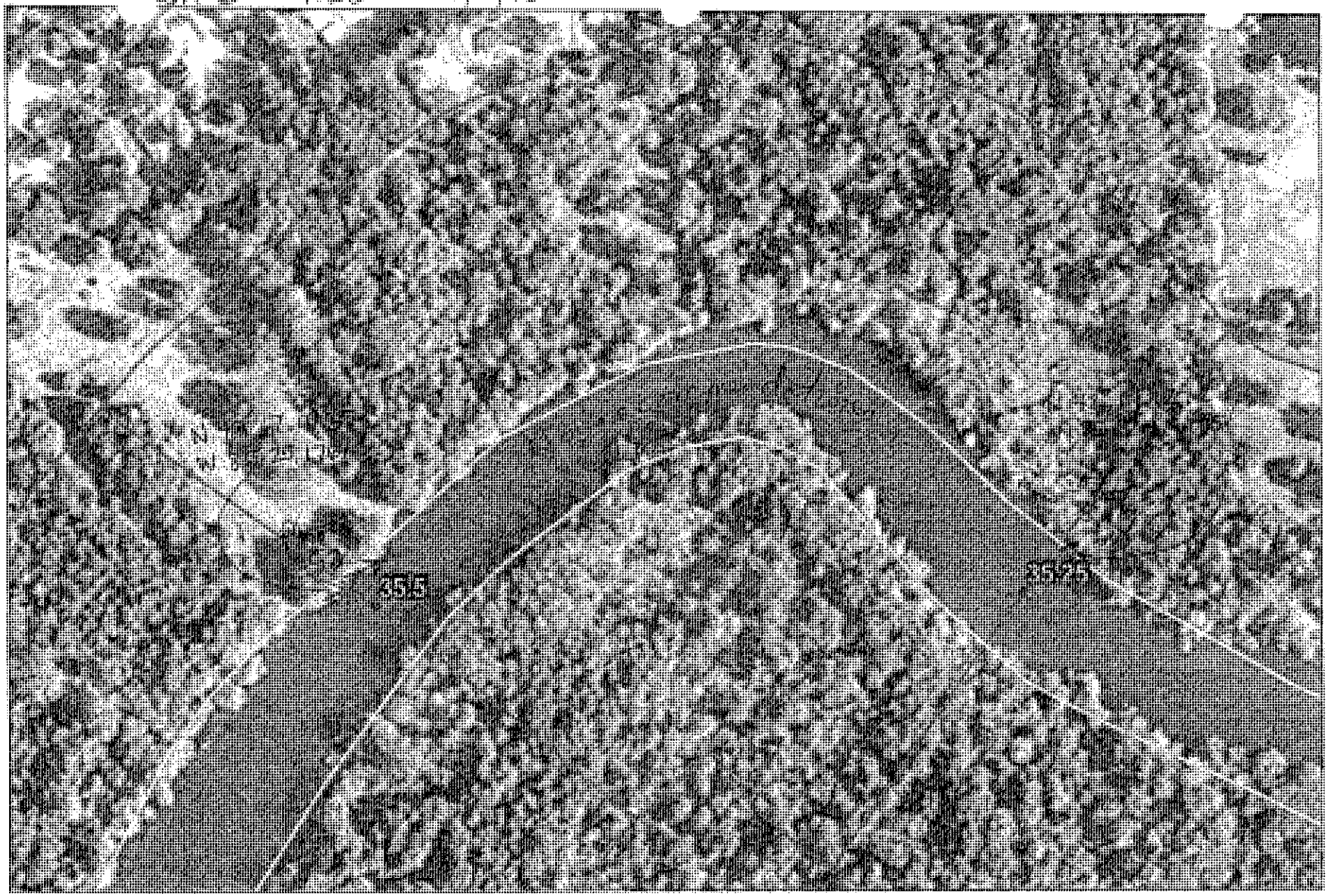
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

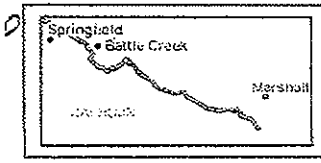
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

35.25-35.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography - USDA, 2009

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 35.25 **to MP** 35.50 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HACK	8-31-10 (date)	Enbridge	
Signature M J NALEPINSKI	31 Aug '10 (date)	EPA	

4. **SCAT Reassessment**

Signature MICHAEL A. LAMBERT	9/5/10 (date)	Enbridge	Jack W. Boss 9/5/10 Jack W. Boss
Signature WILLIAM BATES	9/5/10 (date)	EPA	Stephen Ball 9/5/10 Stephen Ball
Signature Debora Snell	9/6/10 (date)	MDNRE	SARAH VANDEZEE 9/8/10

5. **EPA**

Signature GARY LIPSON	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 35.50



Photo 0368 – Looking northeast at right descending bank near EPA-C-0630.



Photo 0369 – Looking north at right descending bank.

Field Photo Log – Segment MP 35.50



Photo 0370 – Looking west at left descending bank.



Photo 0371 – Looking northwest at right descending bank.

Field Photo Log – Segment MP 35.50



Photo 0372 – Looking south at left descending bank.



Photo 0373 – Looking southwest at right descending bank.

Field Photo Log – Segment MP 35.50



Photo 0374 – Looking north at right descending bank.



Photo 0375 – Looking southwest at right descending bank.

Field Photo Log – Segment MP 35.50



Photo 0376 – Looking south at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 35.75 – MP 35.50 to 35.75

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 35.75 had no oiling on the left descending bank and possible mousse deposits on the right descending bank. An island was present with no observed oiling. The overbank contained no areas requiring clean-up. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 35.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviatiou Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Proccss**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**

Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2. mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

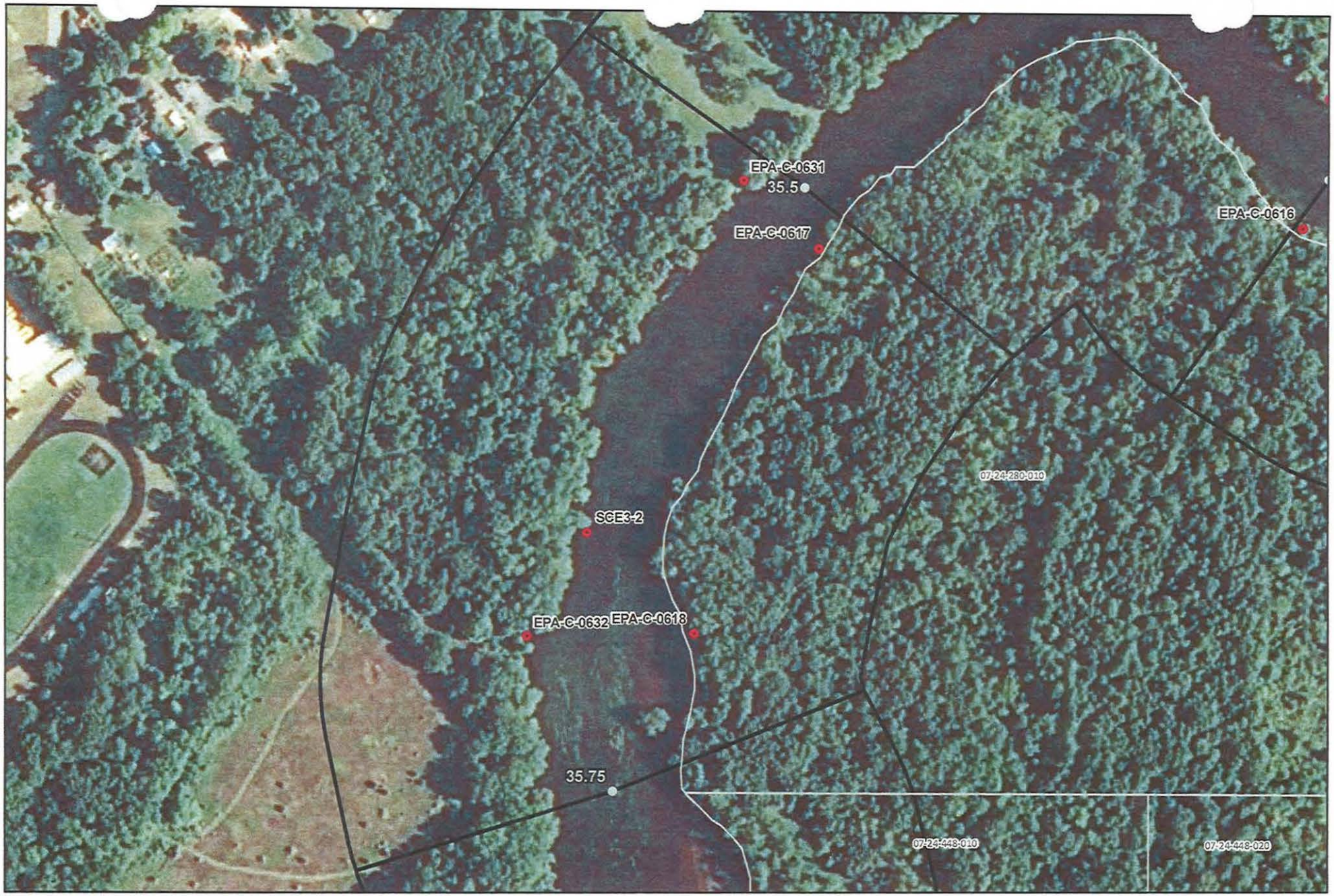
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

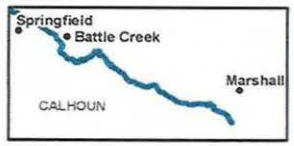
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 35.5-35.75 Left Bank While Looking Downstream										
EPA-C-0617	Channel	SCAT T? 09/01/2010	No Oil conditions reference point only; No Oil condition						42.28458	-85.41904





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 35.5-35.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

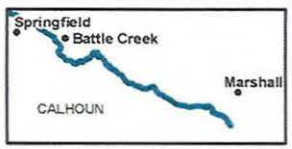
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet


Springfield
Battle Creek
Marshall
Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles
35.5-35.75
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill
0 75 150
Feet
Source: Aerial Photography USDA, 2009
ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 35.5-35.75 Right Bank While Looking Downstream										
SCE3-2	Shoreline	Shoreline Assessment	?			-	Observed boom floating materials (Looks like mousse); Mixed in with floating water. Vegetation rooted in sediment. Oil-based; if SO4 scoop up and dispose.	Observed boom floating materials (Looks like mousse); If SO4 scoop up and dispose.	42.283	-85.420717
EPA-C-0631	Channel	SCAT T? 09/01/2010	No oil observed on shoreline.						42.28495	-85.41960
EPA-C-0632	Channel	SCAT T? 09/01/2010	No oil observed.						42.28243	-85.42115





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 35.5-35.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 35.50 Start MP to End MP 35.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 35.50 Start MP to End MP 35.75 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor) _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From** 3550 **Start MP to End MP** 35.75 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☐

3. **Inspection** — see separate form

Signature (date) Enbridge

Signature (date) EPA

4. **SCAT Reassessment**

Glenn Vanderwater 9/13/10
Signature Glenn Vanderwater (date) Enbridge

R. del Rosario 9/13/10
Signature ROSS DEL ROSARIO (date) EPA

Dana Stravse 9/13/10
Signature Dana Stravse (date) MDNRE

was signed by all three representati after the step 3 inspe

5. **EPA**

Gary Lipsey 9/20/10
Signature GARY LIPSEY (date) EPA Division Supervisor

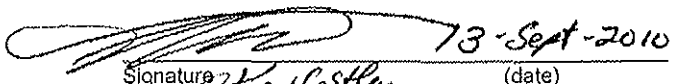
Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 35.50 to MP 35.75 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**



13-Sept-2010 Enbridge
Signature Ken Costley (date)



9/13/10 EPA
Signature Eduardo Rovira (date)

4. **SCAT Reassessment**

_____ Enbridge
Signature (date)

_____ EPA
Signature (date)

_____ MDNRE
Signature (date)

5. **EPA**

_____ EPA Division Supervisor
Signature (date)

Appendix E
Photographs



Photo 0505 – Looking west at right descending bank, near EPA-C-0631.



Photo 0506 – Looking west at right descending bank, near EPA-C-0631.



Photo 0507 – Looking south at left descending bank, near EPA-C-0617.



Photo 0508 – Looking south at left descending bank.



Photo 0509 – Looking southwest at right descending bank.

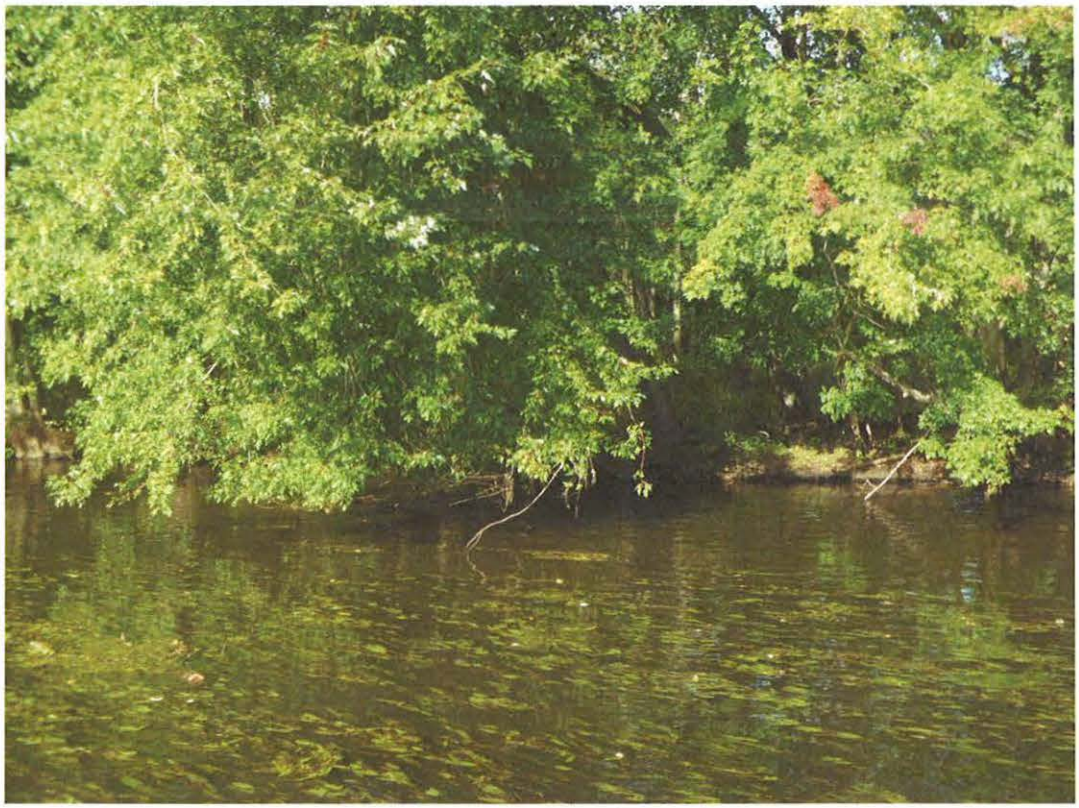


Photo 0510 – Looking west at right descending bank, near EPA-C-0632.



Photo 0511 – Looking east at left descending bank, near EPA-C-0618.



Photo 0512 – Looking southwest at right descending bank, near SCE3-2.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 36.00 – MP 35.75 to 36.00

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 36.00 had no oiling observed on the left or the right descending bank. The overbank contained no areas requiring clean-up and islands were present with no oiling observed. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 36.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
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Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

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FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

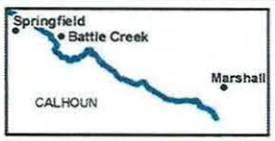
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In[illegible]nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 35.75-36.0 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 35.75-36
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

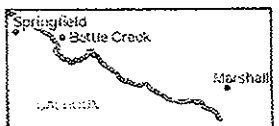
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TGNM 3 9 - 10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

35.75-36

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009

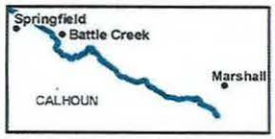
ENTRIX

Enbridge Pipeline Release In... ...t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 35.75-36.0 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 35.75-36
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

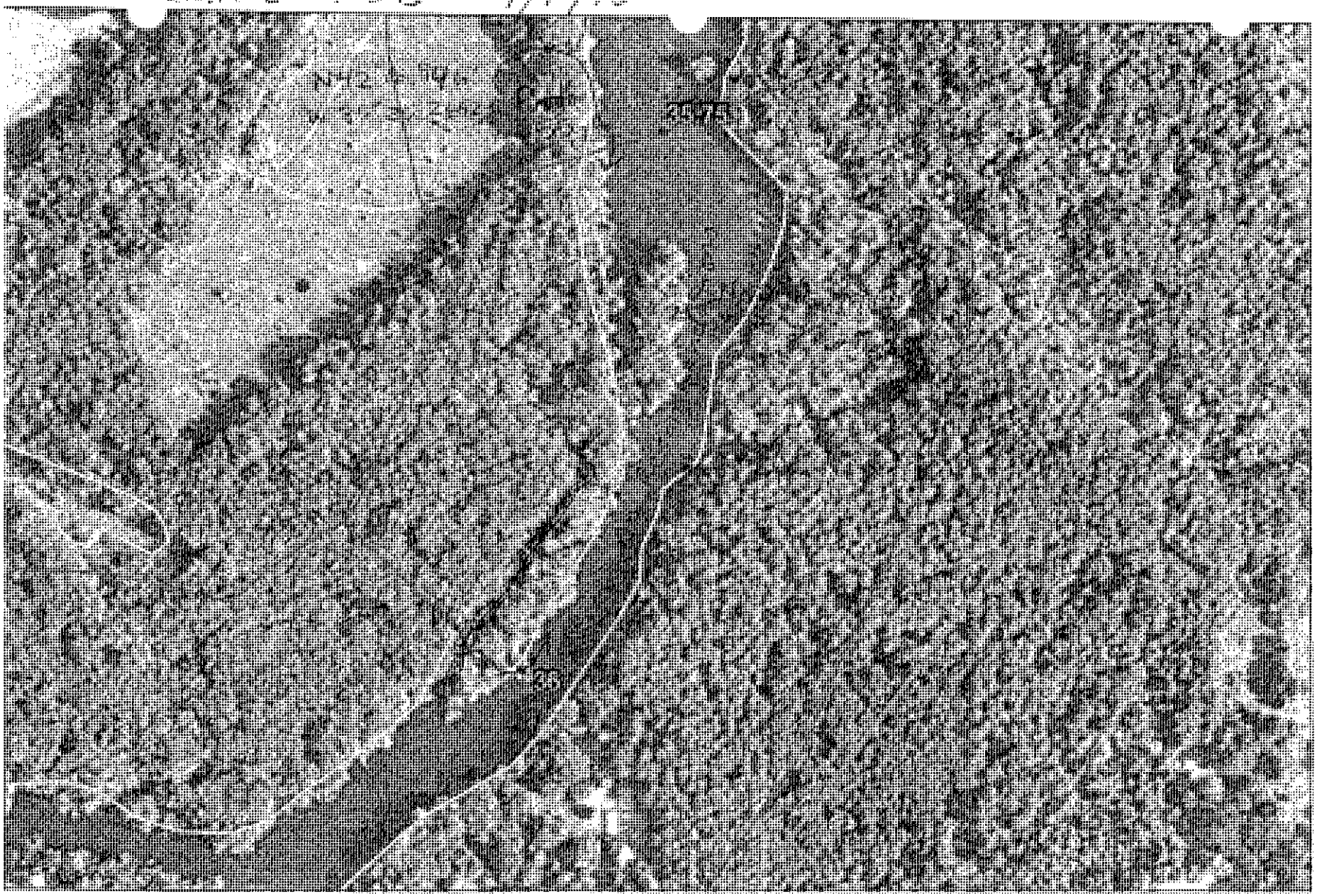
0 75 150
Feet

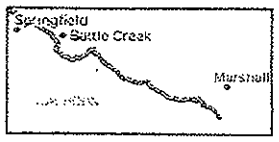
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team 6 IAP 9/11/10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

36.25

35.75-36

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography USDA 2009

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 35.75 Start MP to End MP 36.00 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From** 35.75 **Start MP to End MP** 36.00 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 35.75 **to MP** 36.00 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK	8-31-10 (date)	Enbridge
Signature M J NALIPINSKI	31 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBETIS	9/5/10 (date)	Enbridge Jack W. Boss 9/5/10 Jack W. Boss
Signature WILLIAM BATES	9/5/10 (date)	EPA Stephen Ball 9/5/10 Stephen Ball
Signature Debora Snell	9/6/10 (date)	MDNRE SARAH VANDELFZIEL 9/8/10 Sarah Vagle

5. **EPA**

Signature GARY LIPSON	9/13/10 (date)	EPA Division Supervisor

Appendix E
Photographs

Field Photo Log – Segment MP 36.00



Photo 0257 – Looking northeast at left descending bank.



Photo 0258 – Looking north at right descending bank.

Field Photo Log – Segment MP 36.00



Photo 0259 – Looking northeast at left descending bank.



Photo0260 – Looking north at right descending bank.

Field Photo Log – Segment MP 36.00



Photo0261 – Looking north at island/right descending bank.

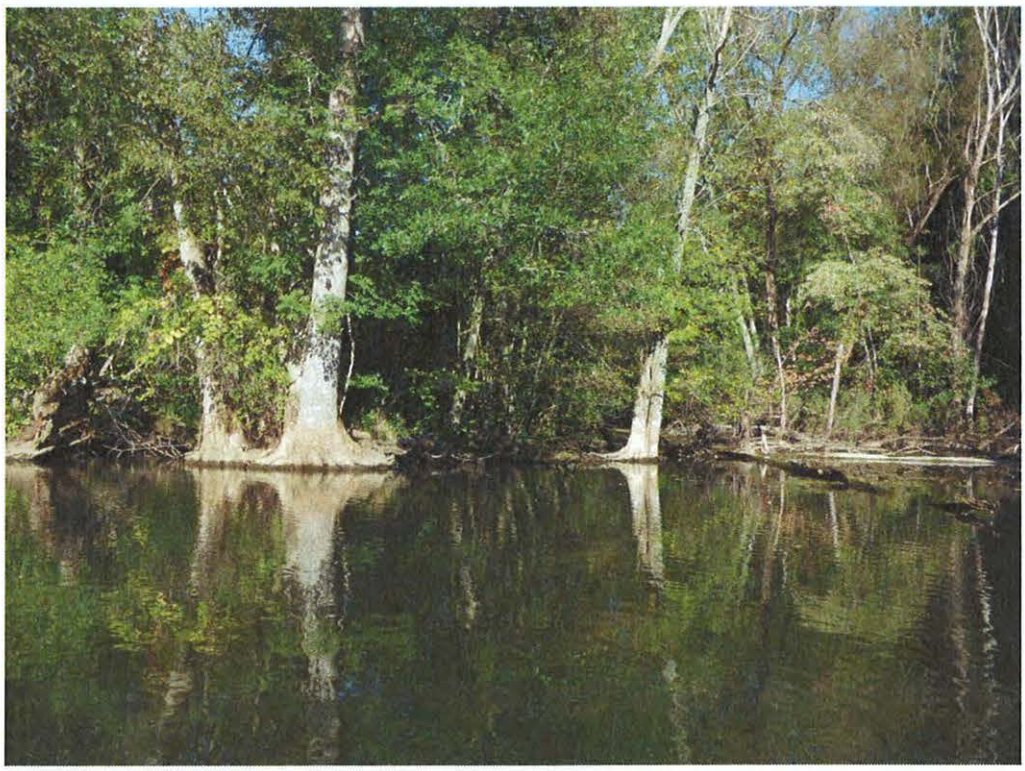


Photo 0262 – Looking northeast at left descending bank.



Photo 0263 – Looking northeast at left descending bank.



Photo 0264 – Looking north at island.

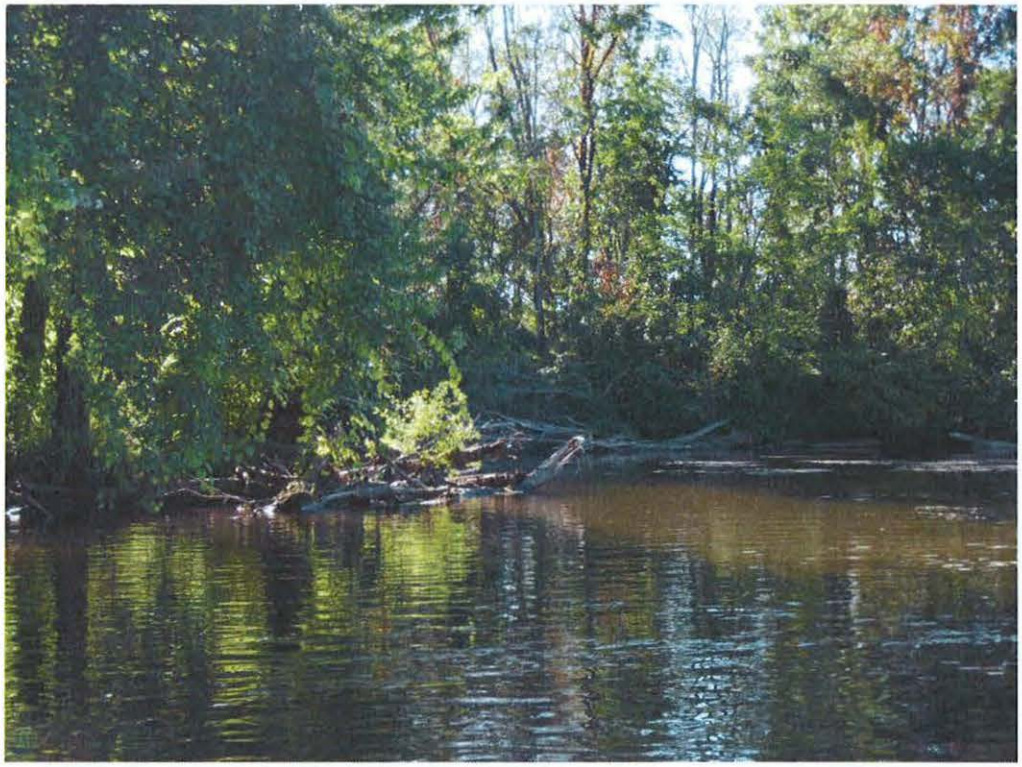


Photo 0265 – Looking west at island/right descending bank.



Photo 0266 – Looking northeast at left descending bank.

Field Photo Log – Segment MP 36.00

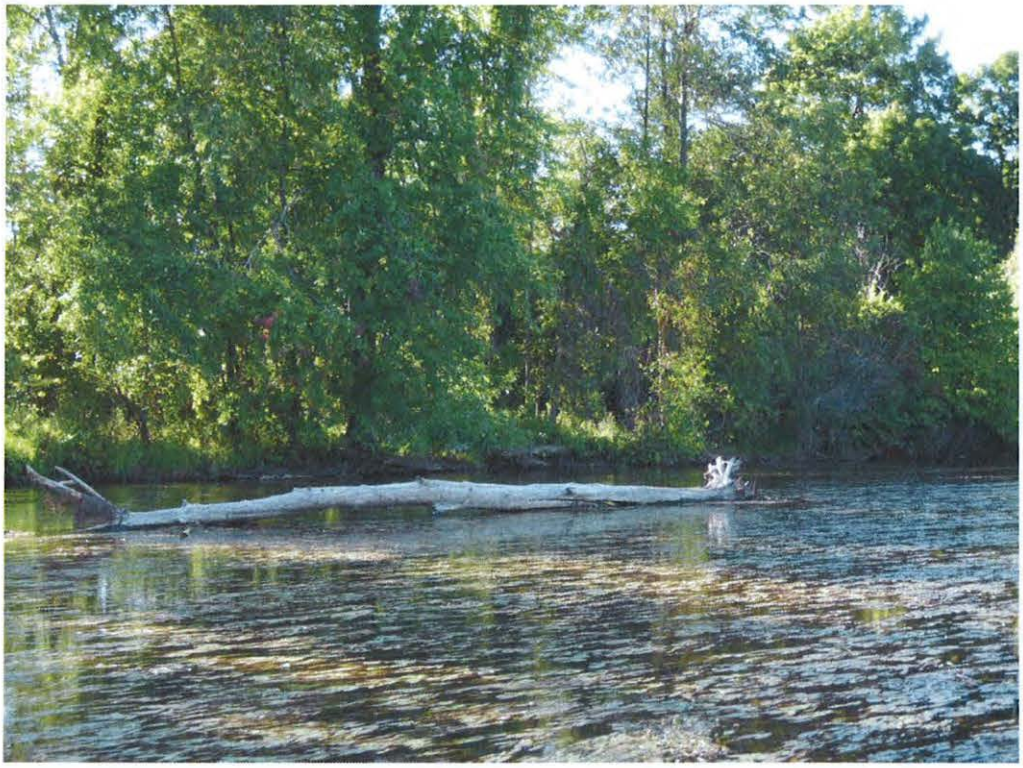


Photo 0267 – Looking northwest at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 36.25 – MP 36.00 to 36.25

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 36.25 had no oiling observed on the left or the right descending bank. The overbank contained no areas requiring clean-up and islands were present but no oiling was observed on them. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 36.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

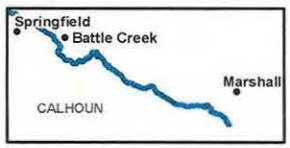
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 36.0-36.25 Left Bank While Looking Downstream										
EPA-C-0619	Channel	SCAT T? 09/01/2010	no oil conditions, reference piont only; No Oil conditions						42.27772	-85.42191
EPA-C-0620	Shoreline	SCAT T? 09/01/2010	home owner concern issue						42.27707	-85.42315





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 36-36.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

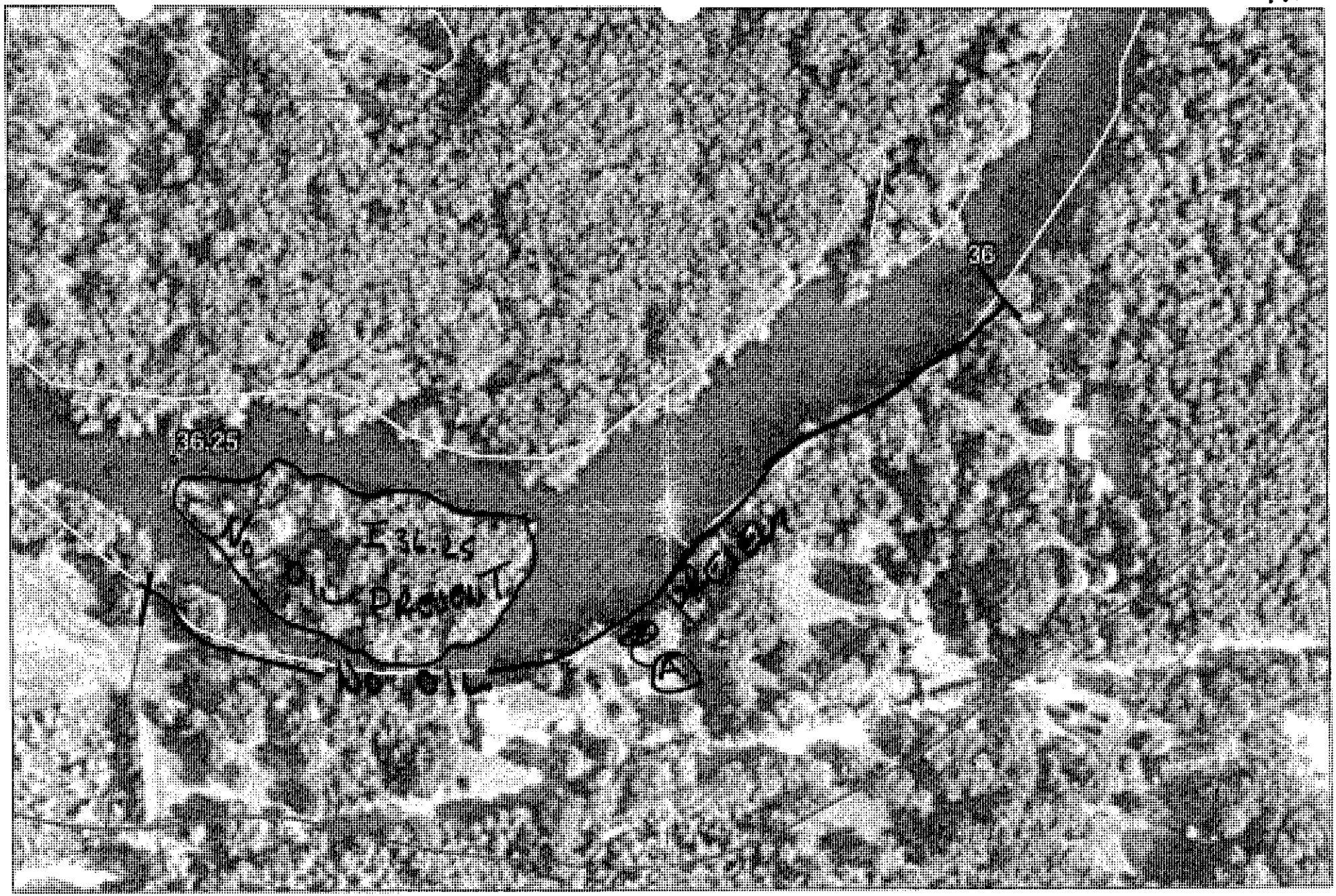
Source: Aerial Photography: USDA, 2009.

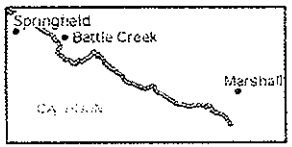
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TEAM 5 7/1/10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

36-36.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography, USDA, 2009.

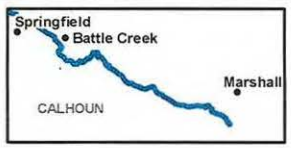
ENTRIX

Enbridge Pipeline Release Inc nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 36.0-36.25 Right Bank While Looking Downstream										
EPA-C-0633	Channel	SCAT T? 09/01/2010	No oil observed.						42.27844	-85.42185





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 36-36.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

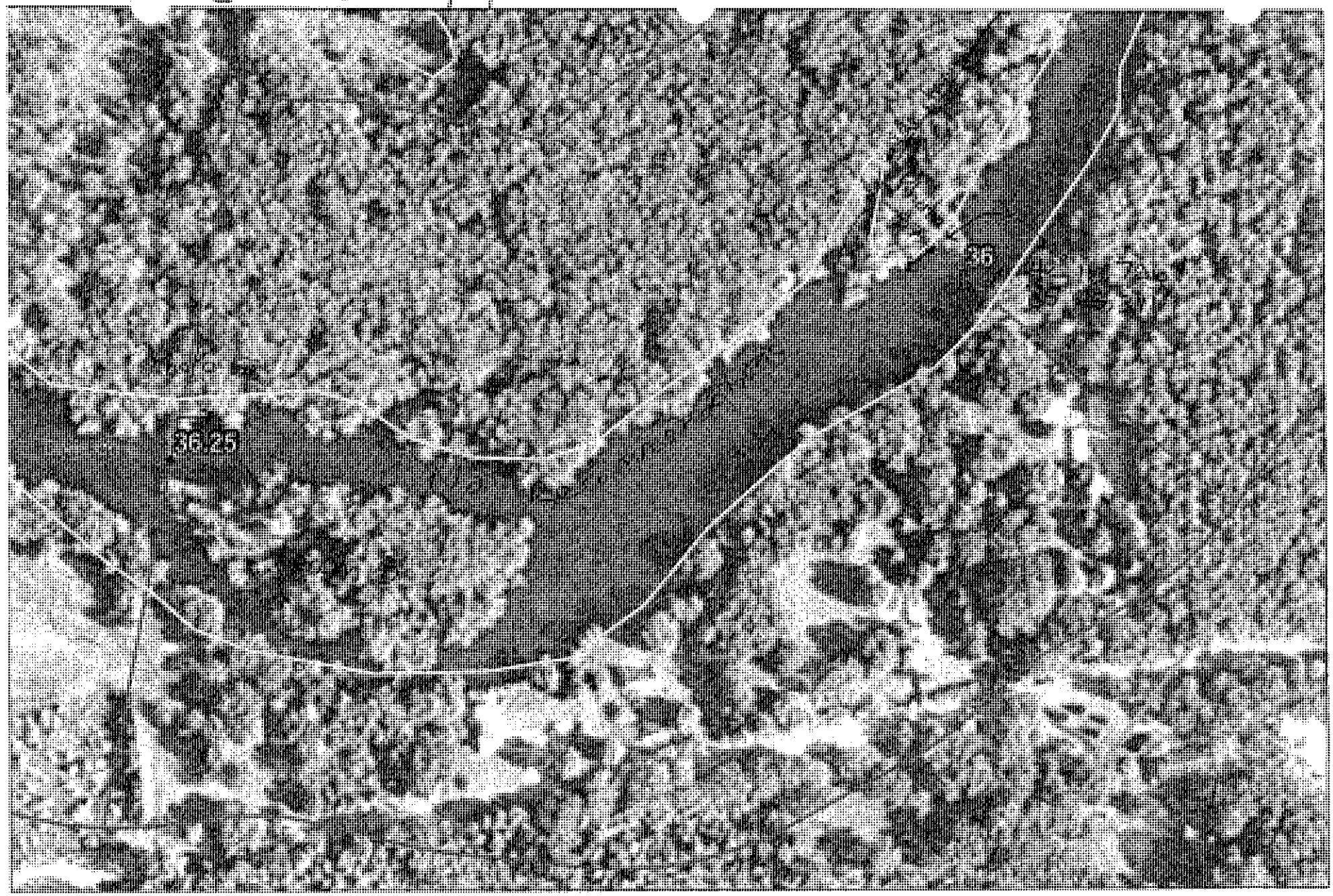
0 75 150 Feet

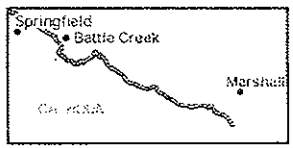
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

36-36.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 36.00 **to MP** 36.25 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUX 8-31-10 (date) Enbridge

Signature M.J. NALIPINSKI 31 Aug '10 (date) EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBETTI 9/5/10 (date) Enbridge Jack W. Boss 9/5/10

Signature WILLIAM BATES 9/5/10 (date) EPA Stephen Ball 9/5/10

Signature Debora Snell 9/6/10 (date) MDNRE SARAH VANDELEZIJL 9/8/10

5. **EPA**

Signature GARY LIPSON 9/18/10 (date) EPA Division Supervisor

Appendix E
Photos



Photo 0246 – Looking south at left descending bank.



Photo 0247 – Looking east at island.



Photo 0248 – Looking southeast at island.



Photo 0249 – Looking northeast at right descending bank.



Photo 0250 – Looking northeast at right descending bank.



Photo 0251 – Looking southeast at island.



Photo 0252 – Looking northeast at right descending bank.



Photo 0253 – Looking southwest at island/left descending bank. Near EPA-C-0620.



Photo 0254 – Looking southwest at left descending bank. Near EPA-C-0620.



Photo 0255 – Looking north at right descending bank.



Photo 0256 – Looking northeast at left descending bank. Near EPA-C-0619.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 36.50 – MP 36.25 to 36.50

Enbridge Energy

September 18, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 36.50 had no observed oiling on the right or left descending banks. The overbank contained no areas requiring clean-up. Islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 36.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Aerial Photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

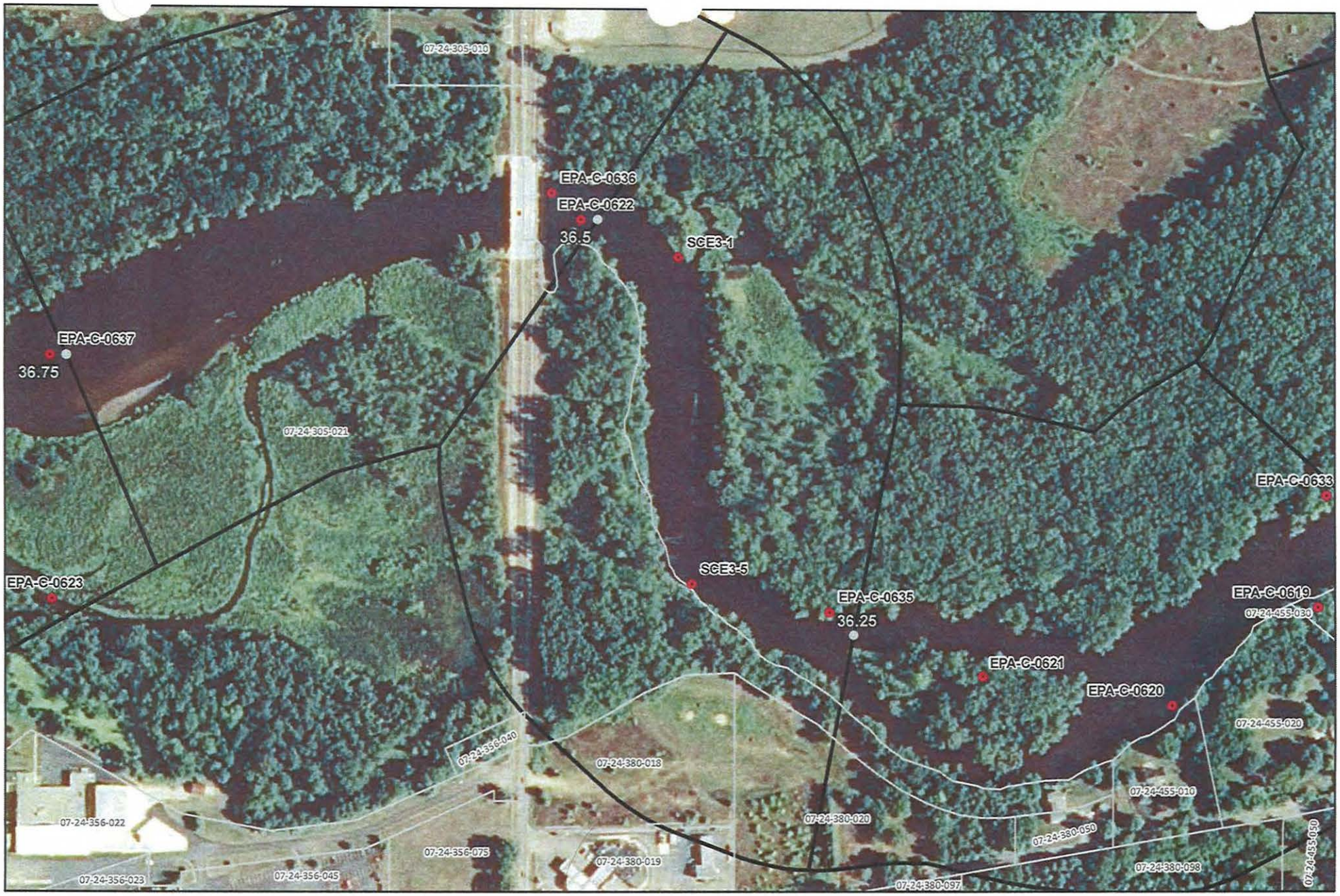
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

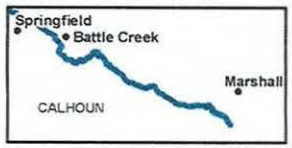
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 36.25-36.5 Left Bank While Looking Downstream										
SCE3-5	Shoreline	Shoreline Assessment			?		Oily leaves (remove oiled vegetation?)	Oily leaves (remove oiled vegetation?)	42.27782	-85.42732





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

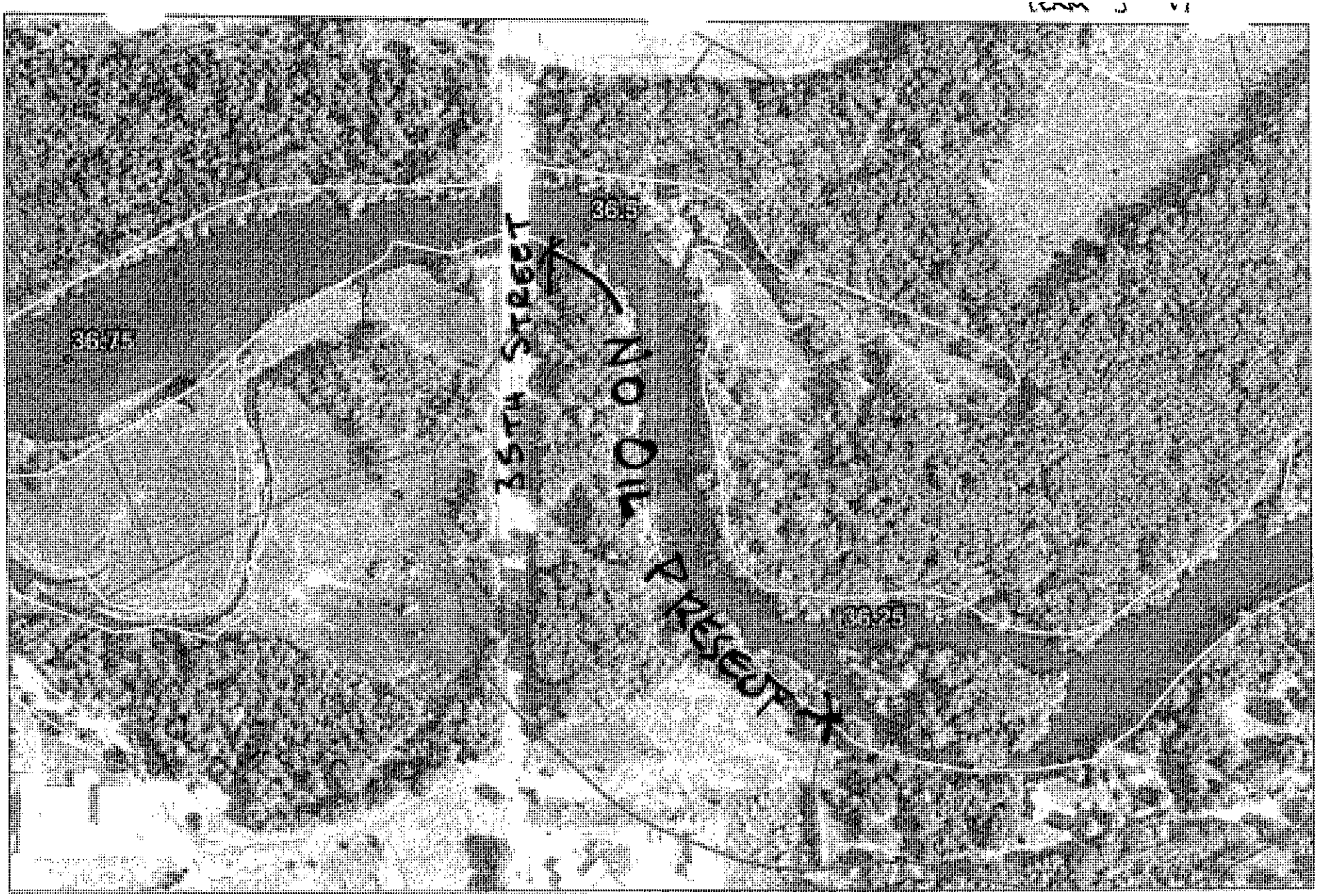
Division E: Mile Marker 36.25-36.5
Left Bank While Looking Downstream

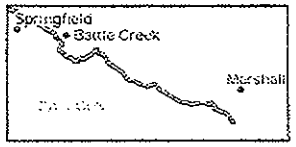
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

36.25-36.5

Enbridge Pipeline Release Incident Kalamazoo River Oil Spill

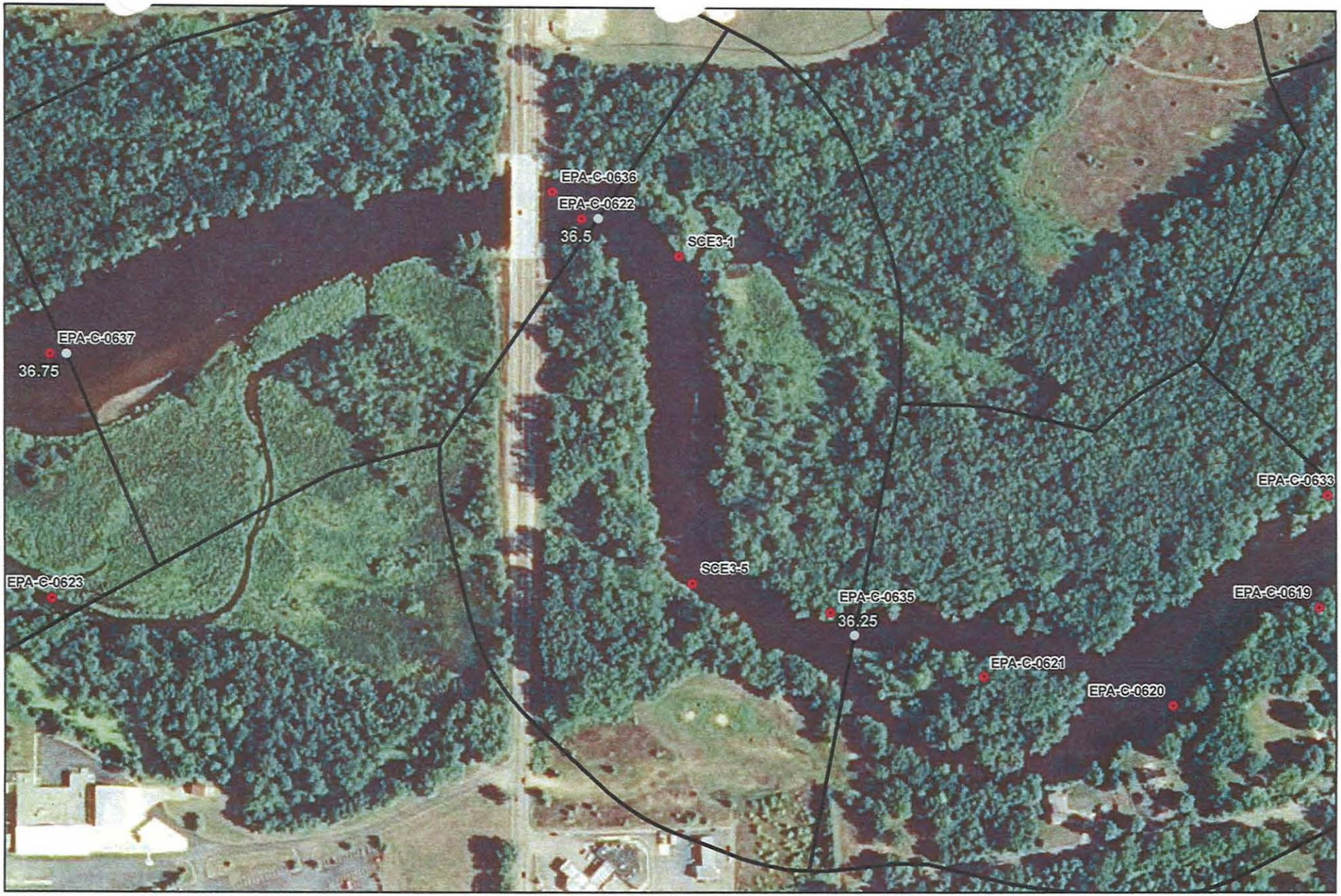
0 75 150
Feet

Source: Aerial Photography, USDA, 2005

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 36.25-36.5 Right Bank While Looking Downstream										
SCE3-1	Shoreline	Shoreline Assessment					Numerous boomed areas of marshland. Appears to be protected from sheen of main channel. No remediation.	No further action required.	42.279917	-85.427467
EPA-C-0635	Channel	SCAT T? 09/01/2010	No oil observed.						42.27765	-85.42612





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Division E: Mile Marker 36.25-36.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

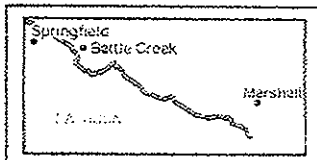
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

36.25-36.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography USDA, 2009

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 36.25 Start MP to End MP 36.50 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 36.25 Start MP to End MP 36.50 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From** 36.25 **Start MP to End MP** 36.5 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☐

3. **Inspection** → See separate form

Signature (date) Enbridge

Signature (date) EPA

4. **SCAT Reassessment**

Glenn Vanderwater 9/13/10 Enbridge
Signature Glenn Vande Water (date)

R. dell'Isola 9/13/10 EPA
Signature (date)
ROSS DELROSARIO

Dana Strouse 9/13/10 MDNRE
Signature Dana Strouse (date)

was signed by all three representatives after the step 3 inspections

5. **EPA**

Gary Lipson 9/18/10 EPA Division Supervisor
Signature (date)
GARY LIPSON

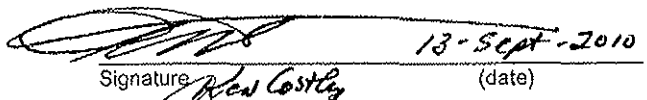
Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 36.25 to MP 36.50 Segment Length: 0.25 mile

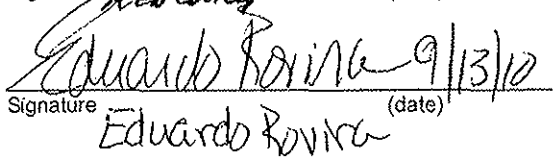
1. **SCAT** ☐

2. **Clean up** ☑

3. **Inspection**



Signature Ken Costley (date) 13-Sept-2010 Enbridge



Signature Eduardo Rivera (date) 9/13/10 EPA

4. **SCAT Reassessment**

_____ Enbridge
Signature (date)

_____ EPA
Signature (date)

_____ MDNRE
Signature (date)

5. **EPA**

_____ EPA Division Supervisor
Signature (date)

Appendix E
Photographs



Photo 0513 – Looking northeast at right descending bank, near EPA-C-0635.



Photo 0514 – Looking southeast at left descending bank.



Photo 0515 – Looking north at right descending bank.



Photo 0516 – Looking west at left descending bank, near SCE3-5.



Photo 0517 – Looking southwest at left descending bank, near SCE3-5.



Photo 0518 – Looking northeast at right descending bank.



Photo 0519 – Looking northwest at left descending bank.



Photo 0520 – Looking northwest at left descending bank.



Photo 0521 – Looking northeast at right descending bank, near SCE3-1.



Photo 0522 – Looking north at right descending bank, near SCE3-1.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Response Completion Report
Kalamazoo River Segment 36.75 – MP 36.50 to 36.75

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the response completion report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 36.75 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

No oiled conditions exist. Segment 36.75 has reached the operational endpoints pursuant to EPA's Clean Water Act. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

able 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

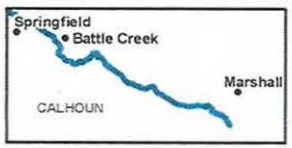
Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 36.5-36.75 Left Bank While Looking Downstream										
EPA-C-0622	Channel	SCAT T? 09/01/2010	No Oil, reference Point only; . No oil conditions						42.28015	-85.42831





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 36.5-36.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

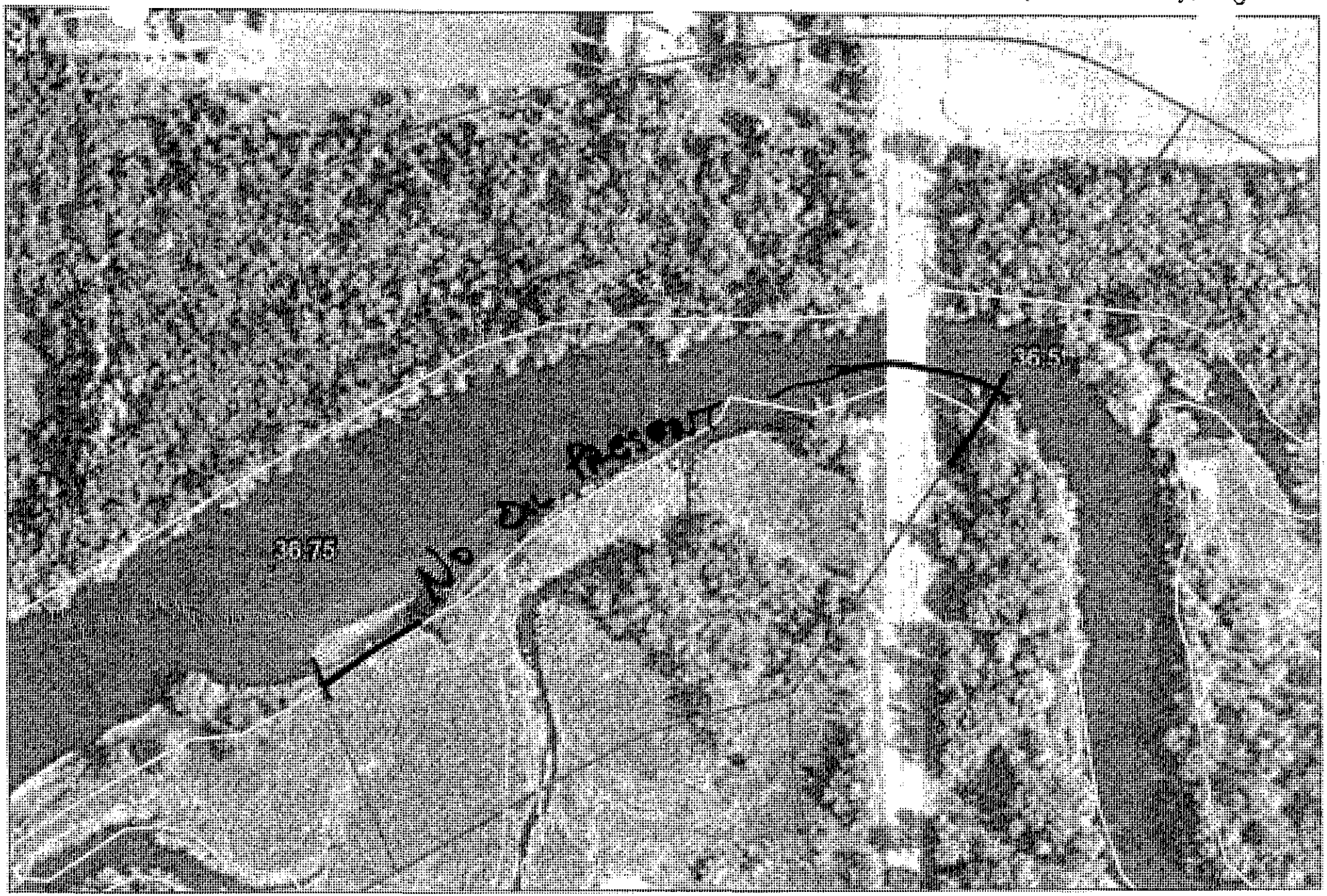
0 75 150
Feet

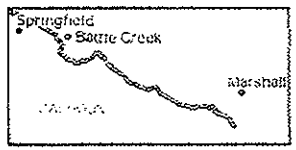
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

TEAM 5 9/1/10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

36.5-36.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA 2008

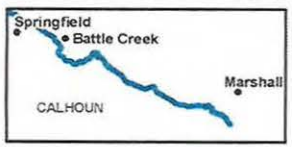
ENTRIX

Enbridge Pipeline Release Inc. .it - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 36.5-36.75 Right Bank While Looking Downstream										
EPA-C-0636	Channel	SCAT T? 09/01/2010	No oil observed.						42.28032	-85.42857





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 36.5-36.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

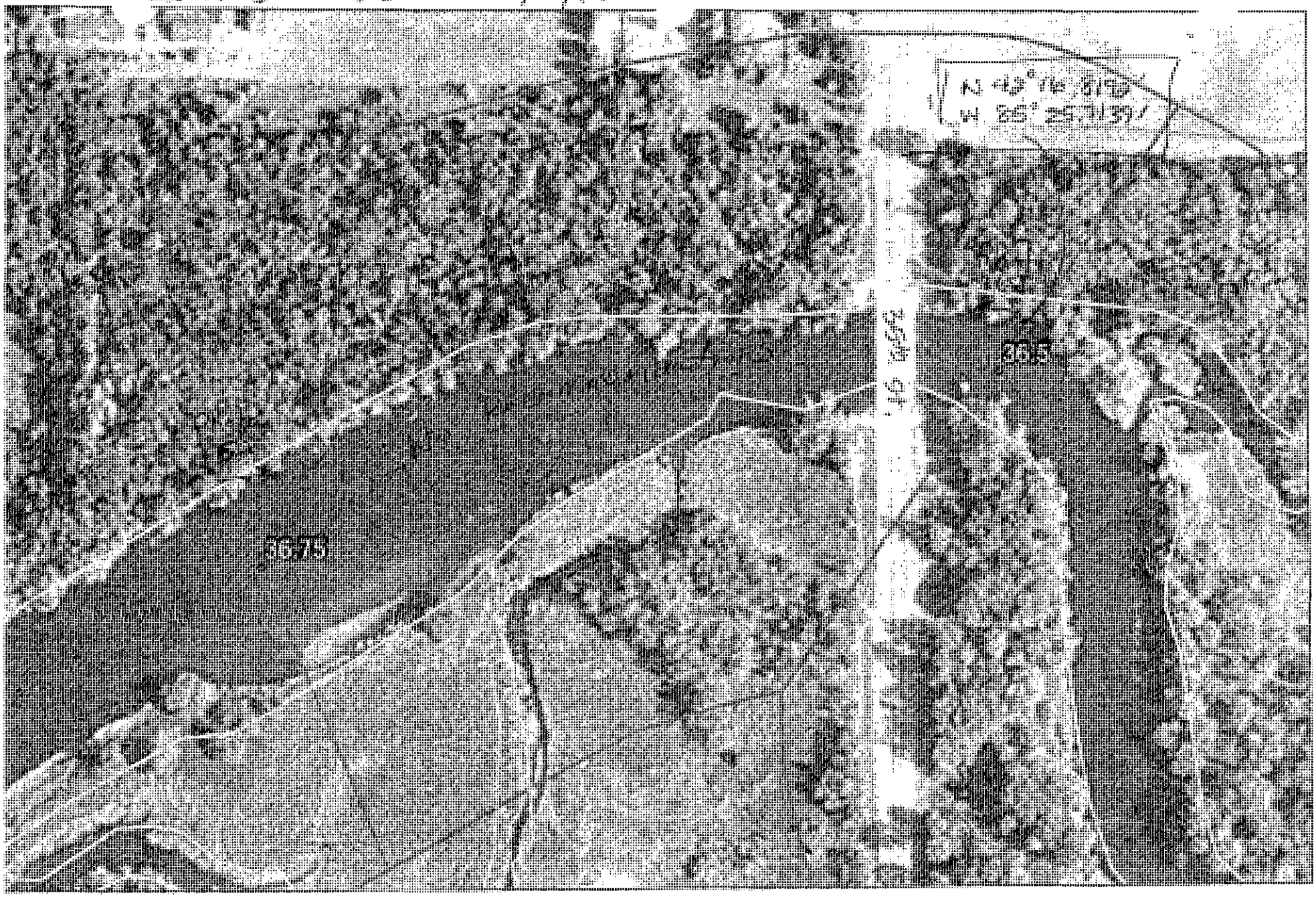
0 75 150 Feet

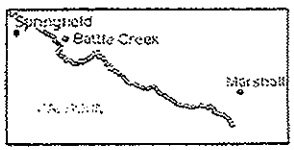
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

36.5-36.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source Aerial Photography USDA 2008

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 36.50 **to MP** 36.75 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUK	8 31-10 (date)	Enbridge
Signature M J NALEPINSKI	31 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBETIS	9/5/10 (date)	Enbridge Jack W. Bass 9/5/10
Signature WILLIAM BATES	9/5/10 (date)	EPA Stephen Ball 9/5/10
Signature Debora Snell	9/6/10 (date)	MDNRE SARAH VANDERZWIJL 9/8

5. **EPA**

Signature	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0239 – Looking northeast at left descending bank.



Photo 0240 – Looking northeast at right descending bank.



Photo 0241 – Looking northeast at right descending bank.



Photo 0242 – Looking east at left descending bank.



Photo 0243 – Looking northeast at right descending bank.

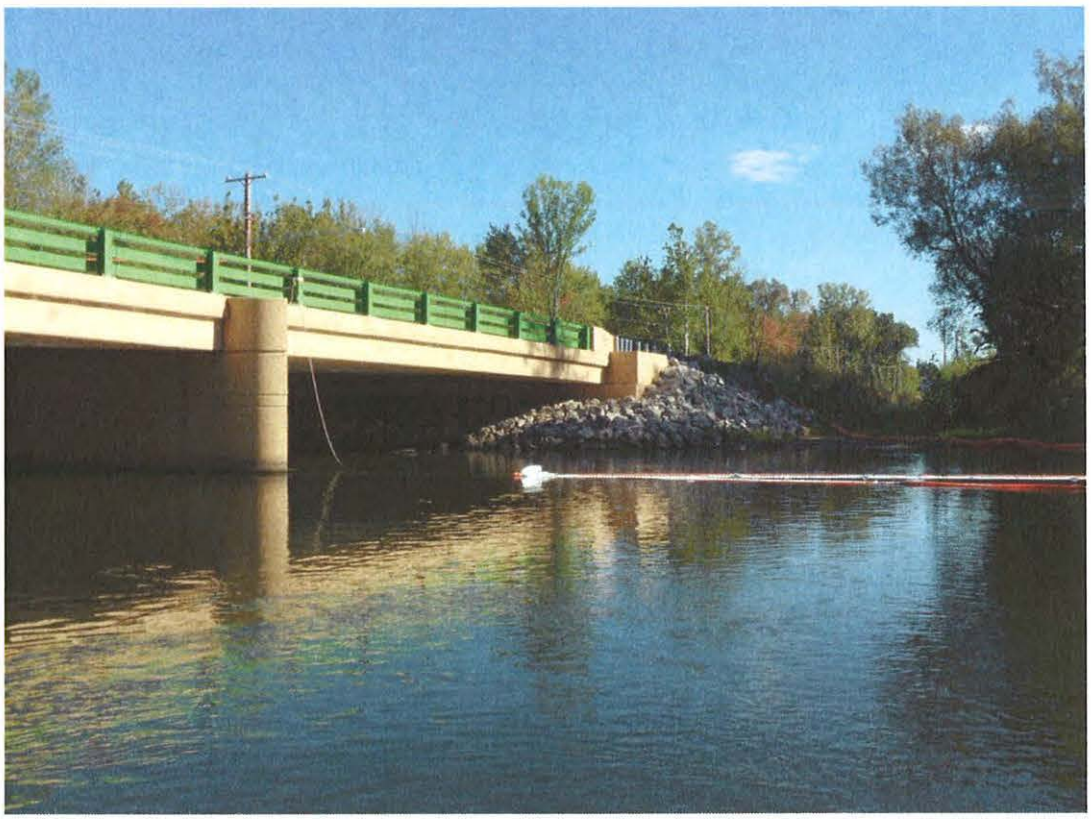


Photo 0244 – Looking southeast at left descending bank.



Photo 0245 – Looking north at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 37.0 – MP 36.75 to 37.0

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 37.00 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up. Multiple islands were present, but no shoreline oiling was observed. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 37.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

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PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

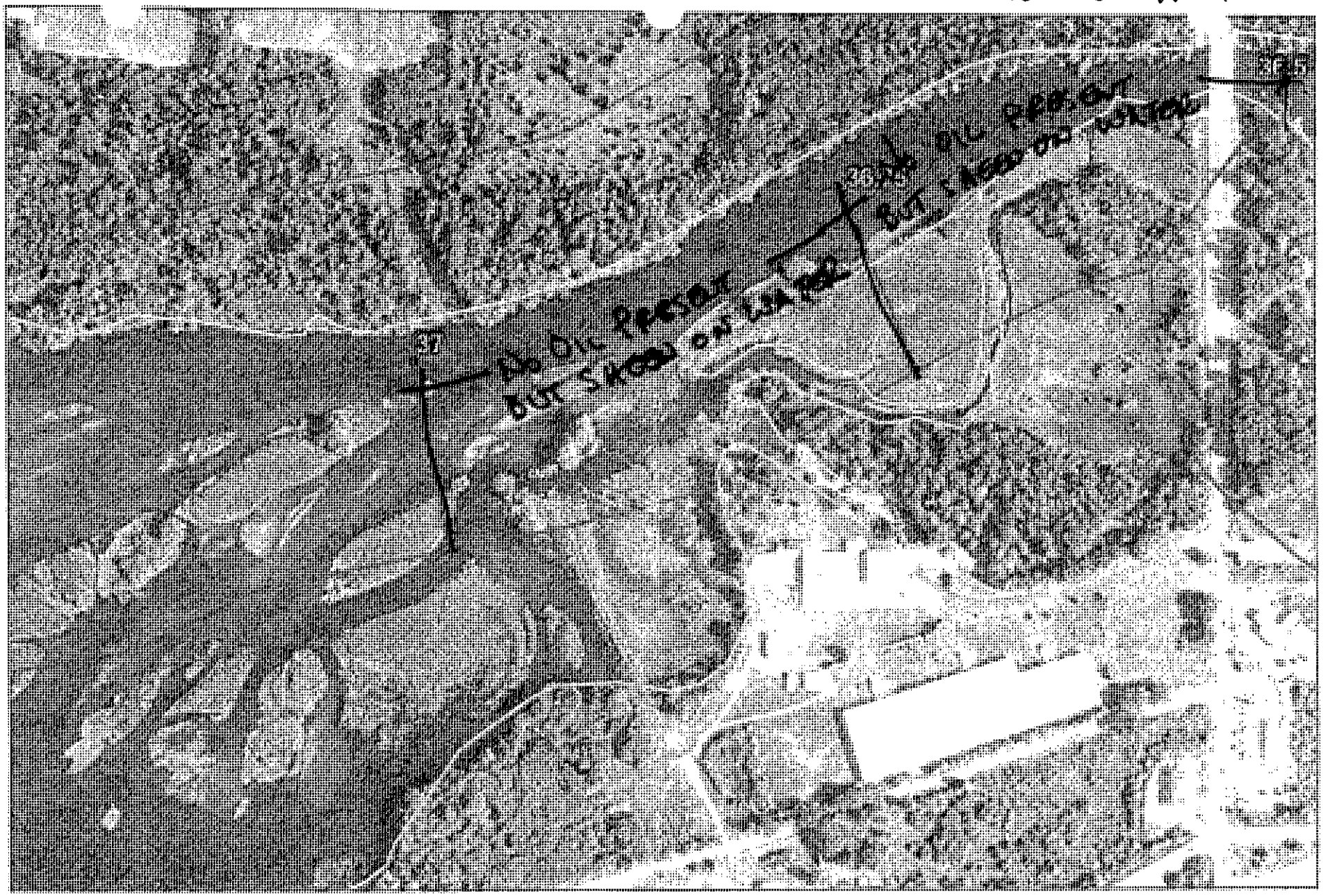
Appendix A
Step 1 - SCAT Documentation

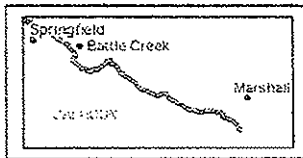
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 36.75-37.0 Left Bank While Looking Downstream										
EPA-C-0623	Channel	SCAT T? 09/01/2010	no oil conditions, on water :sheen						42.27767	-85.43283

TEAM 3 7/1/12





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

36.75-37

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009

ENTRIX





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 36.75-37
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

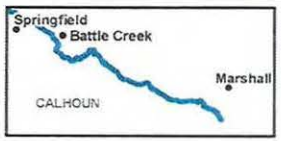
ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In... ...it - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 36.75-37.0 Right Bank While Looking Downstream										
EPA-C-0637	Channel	SCAT T? 09/01/2010	No oil observed.						42.27923	-85.43288





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 36.75-37
Right Bank While Looking Downstream

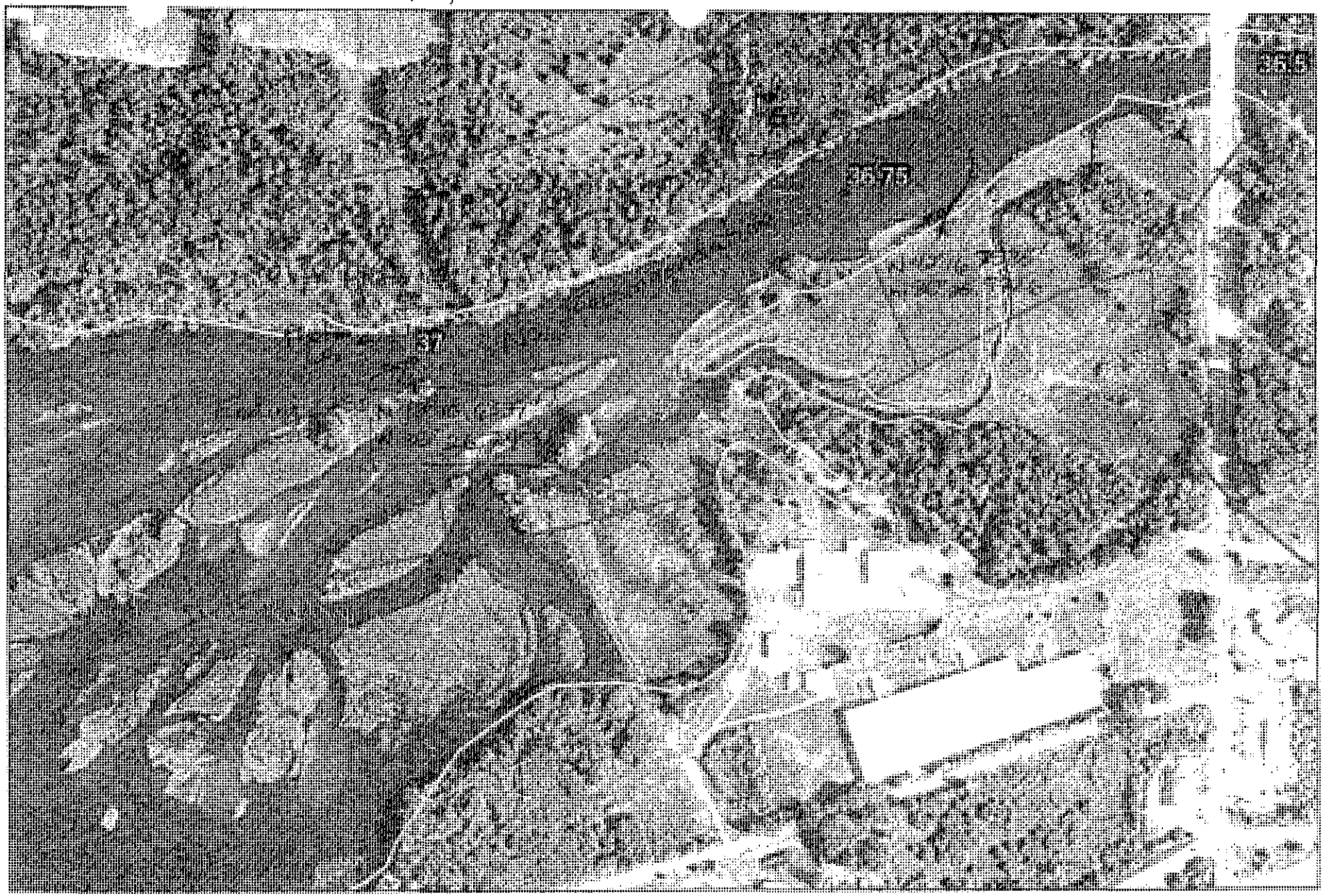
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

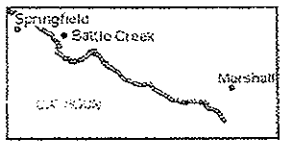
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Team 6 KDD 7/1/10





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

36.75-37

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography USDA, 2009.

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 36.75 **to MP** 37.00 **Segment Length: 0.25 mile**

1. **SCAT** ☐
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HUNT	8-31-10 (date)	Enbridge
MJ Nalipinski	31 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature MICHAEL A. ZAMBETTI	9/5/10 (date)	Enbridge Jack W. Boss 9/5/10
Signature WILLIAM BATES	9/5/10 (date)	EPA Stephen Ball 9/5/10
Signature Debora Snell	9/6/10 (date)	MDNRE SARAH VANDERPLOEG 9/6/10

5. **EPA**

Signature	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0220 – Looking north at island.



Photo 0221 – Looking east at left descending bank.

Field Photo Log – Segment MP 37.00



Photo 0222 – Looking northwest at left descending bank.



Photo 0223 – Looking southeast at left descending bank.



Photo 0224 – Looking east at left descending bank.



Photo 0225 – Looking northwest at island.



Photo 0226 – Looking southeast at left descending bank. Near EPA-C-623.

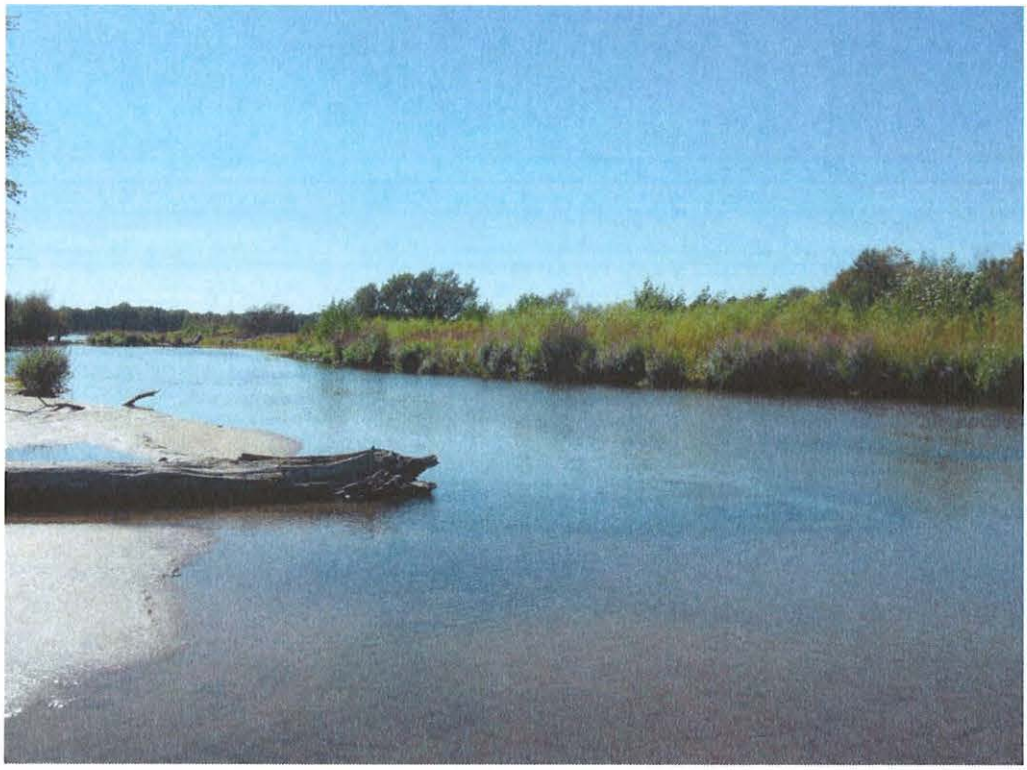


Photo 0227 – Looking west at island.



Photo 0228 – Looking east at left descending bank.



Photo 0229 – Looking south at left descending bank. Near EPA-C-637.

Field Photo Log – Segment MP 37.00



Photo 0230 – Looking west at right descending bank.

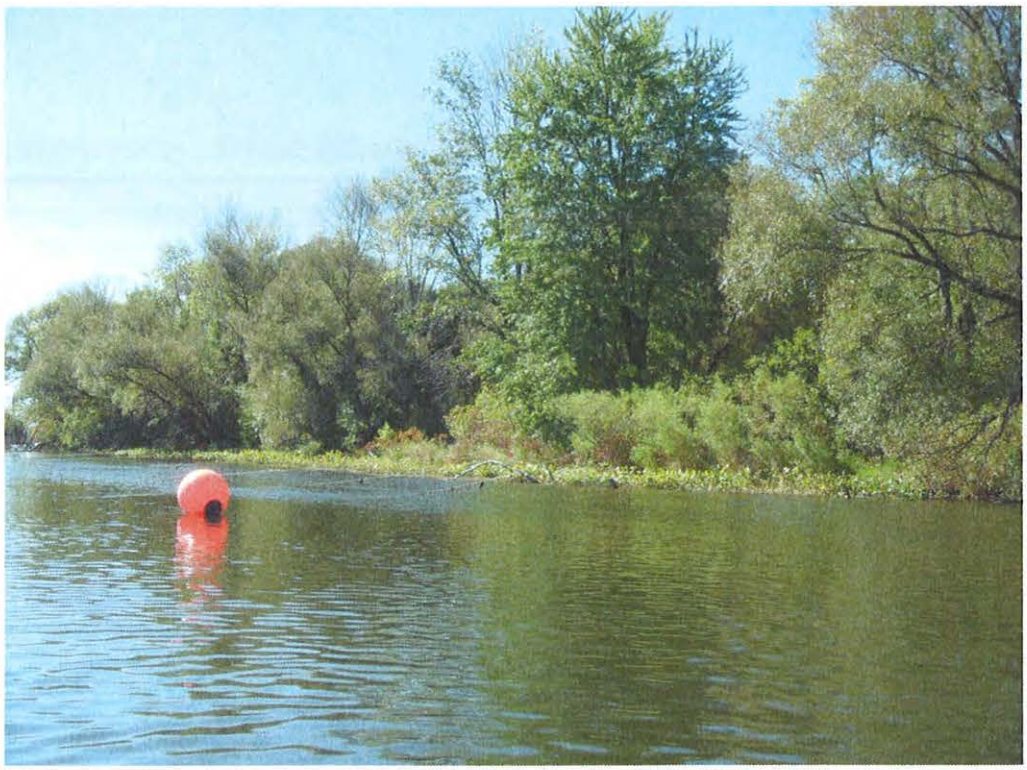


Photo 0231 – Looking west at right descending bank.

Field Photo Log – Segment MP 37.00



Photo 0232 – Looking west at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 37.25 – MP 37.0 to 37.25

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 37.25 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up. Multiple islands were present, but no shoreline oiling was observed. There were no problematic areas that require special attention.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 37.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 37.0-37.25 Left Bank While Looking Downstream										
EPA-C-0624	Channel	SCAT T? 09/01/2010	No oil, reference point only; no oil present but sheen on water						42.27794	-85.43754





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 37-37.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

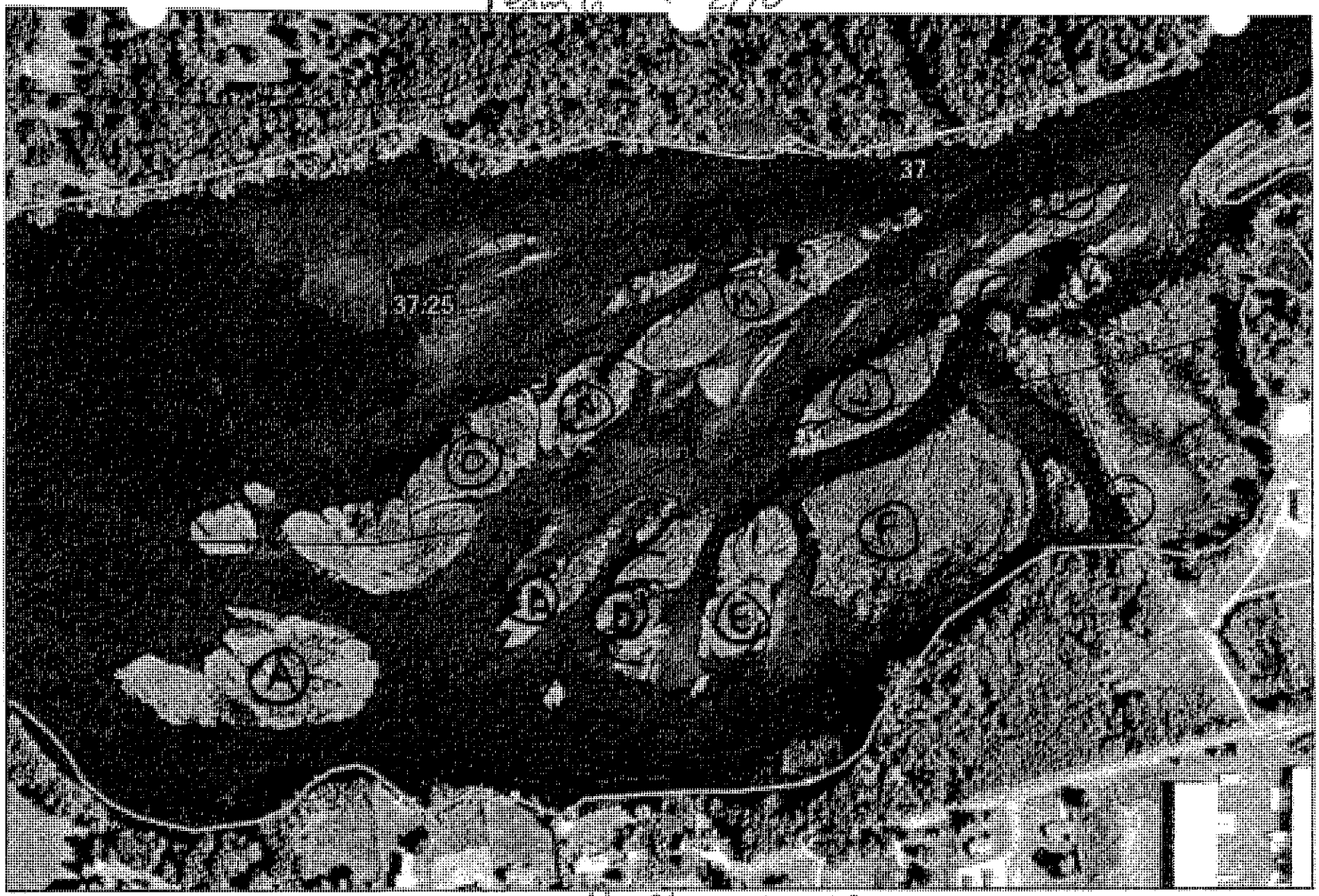
0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Team 6 5/2/10



No Clean-up RCS.



Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

37-37.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

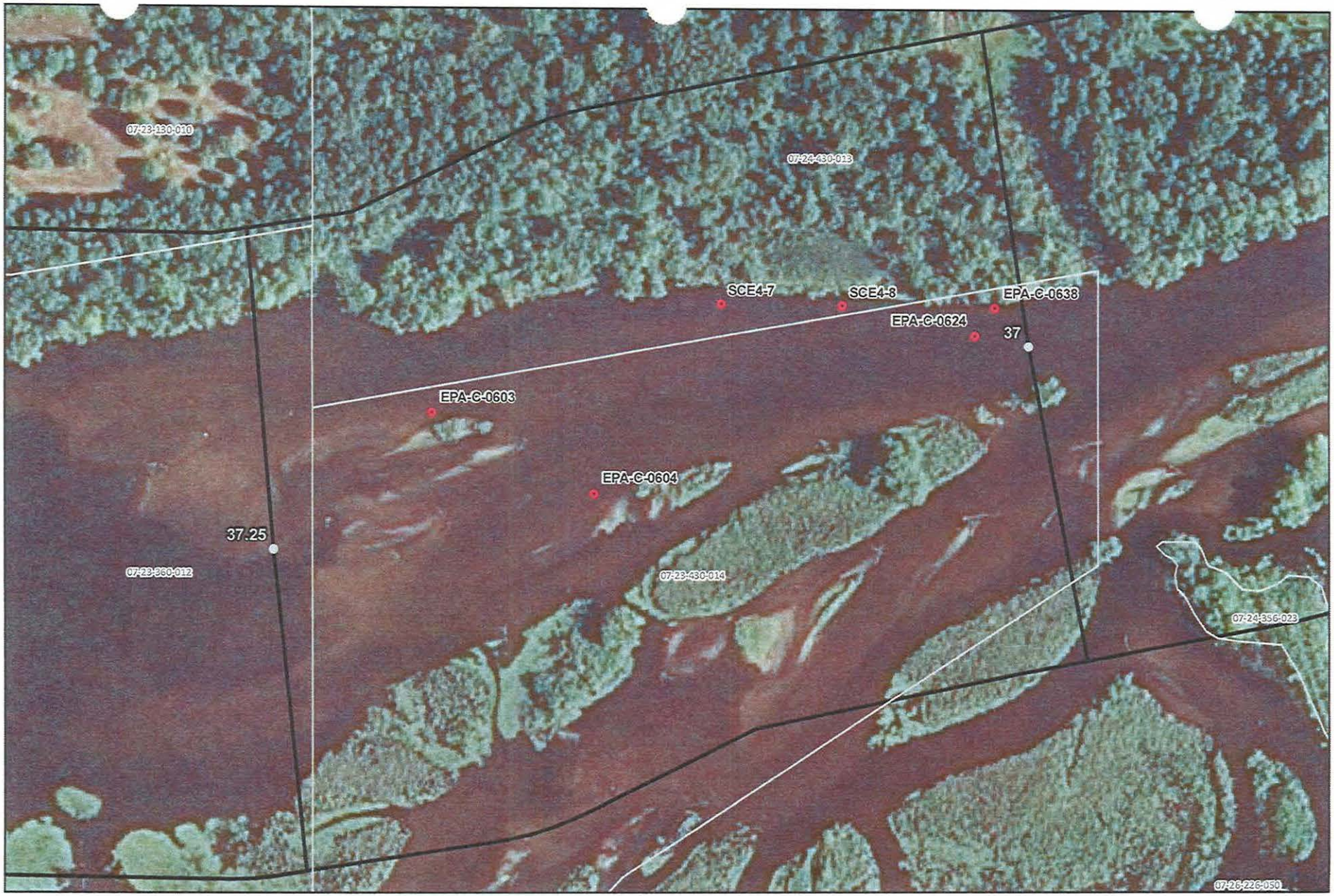
0 75 150 Feet

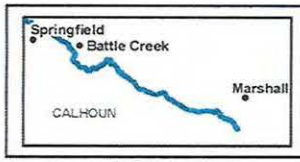
Source: Aerial Photography: USDA, 2008.

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 37.0-37.25 Island										
EPA-C-0603	Channel	SCAT T4 09/02/2010	Silvery sheen created from disturbing sediment near island. Natural attenuation recommended.; Small island complex dominated by purple loosestrife. Silvery oil sheen created from distrubing sediments. Natural attenuation the recommended action.					Natural attenuation recommended.	42.27755	-85.4409
EPA-C-0604	Shoreline	SCAT T4 09/02/2010	Thin film in sediment along N bank. Observed by stepping in sediment and seeing sheen emerge.; Thin film in sediment along N bank. Natural attenuation.					Natural attenuation recommended.	42.27719	-85.43989





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

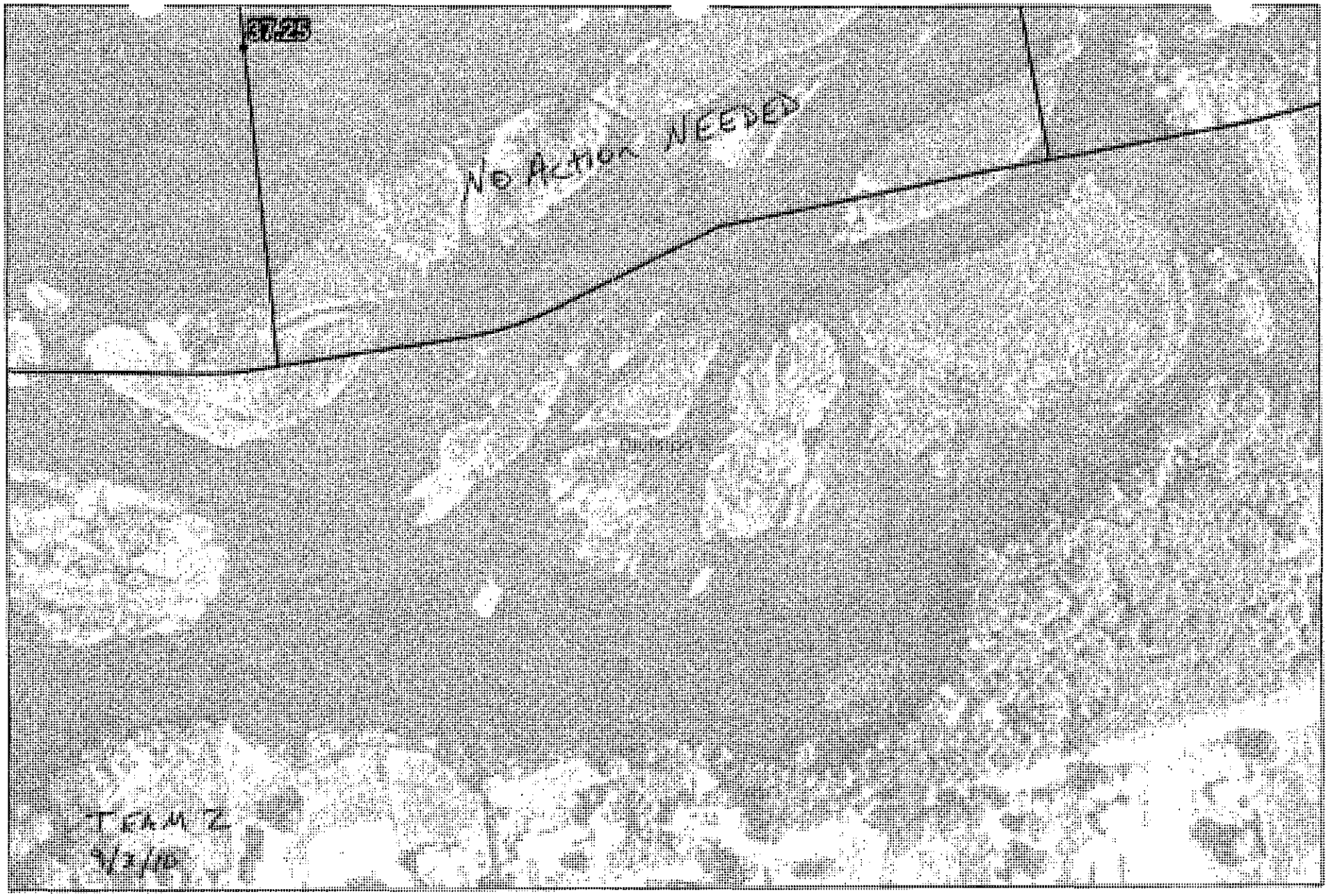
Division E: Mile Marker 37-37.25 Island

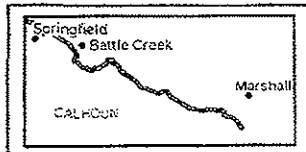
Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

37-37.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete – NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Revetted – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 37.00 **to MP** 37.25 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HOCK	8-31-10 (date)	Enbridge
M J Nalipinski Signature M J NALIPINSKI	31 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Christine R. Jump	9/6/10 (date)	EPA ~~Enbridge~~
Karen Van Tiem Karen Van Tiem Enbridge EPA Signature WILLIAM BATES	09-05-10 9/5/10 (date)	Enbridge ~~EPA~~ MICHAEL A. ZAMBETIS 9/5/10
Signature Kathleen Fairchild	9/5/10 (date)	MDNRE SARAH VANDELFLISL 9/8/10

5. **EPA**

Signature	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0171 – Looking east at island.



Photo 0172 – Looking east at island. Near EPA-C-604.



Photo 0173 – Looking north at island. Near EPA-C-604.



Photo 0174 – Looking east at island.



Photo 0175 – Looking north at right descending bank. Near EPA-C-624.



Photo 0176 – Looking northwest at right descending bank.

Field Photo Log – Segment MP 37.25



Photo 0177 – Looking northwest at right descending bank.



Photo 0178 – Looking northeast at island.



Photo 0179 – Looking southwest at island.



Photo 0180 – Looking south at island.

Field Photo Log – Segment MP 37.25



Photo 0181 – Looking east at island.



Photo 0182 – Looking southwest at left descending bank.



Photo 0183 – Looking north at island.



Photo 0184 – Looking northwest at island.

Field Photo Log – Segment MP 37.25

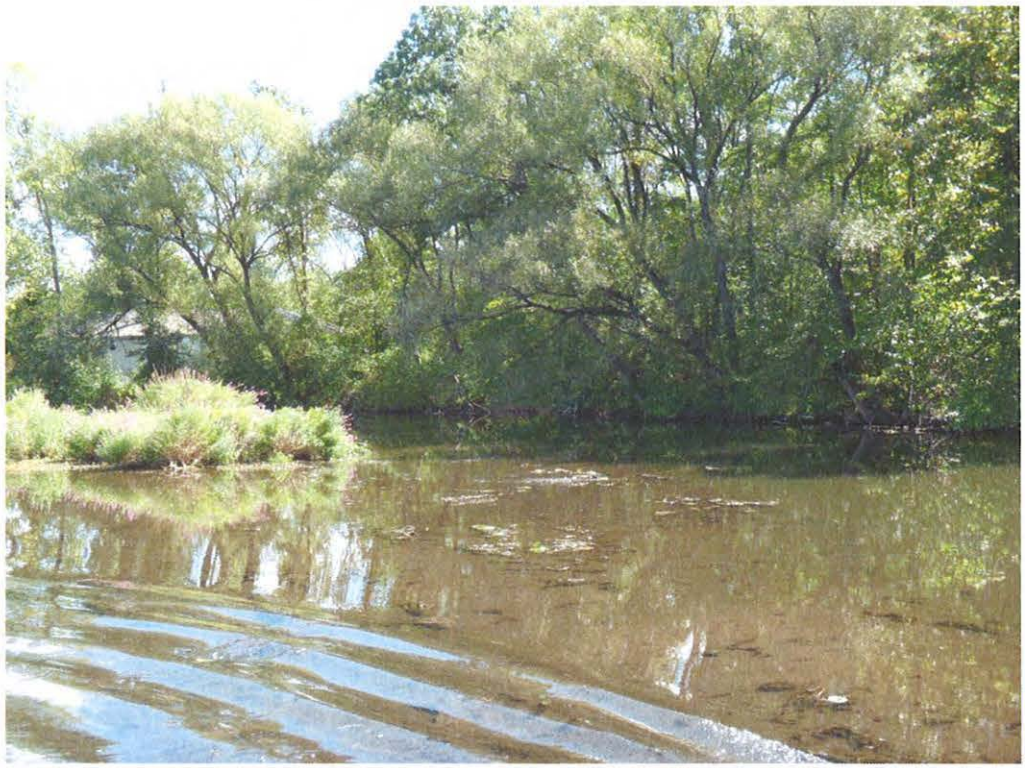


Photo 0185 – Looking east at left descending bank.



Photo 0186 – Looking southwest at left descending bank.

Field Photo Log – Segment MP 37.25



Photo 0187 – Looking northwest at island.



Photo 0188 – Looking west at island.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 37.50 – MP 37.25 to 37.50

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 37.50 had no oiling observed on either the left or right descending bank. The overbank contained no areas requiring clean-up and islands were present with no oiling observed. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 37.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
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Surface Oiling Descriptors - Type

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MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

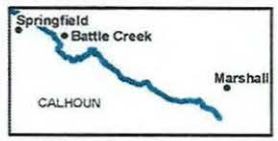
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 37.25-37.5 Left Bank While Looking Downstream										
SCE4-9	Shoreline	Shoreline Assessment			•		Sheen on lake (east end to south bank).	Sheen on lake (east end to south bank).	42.27495	-85.44375





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 37.25-37.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

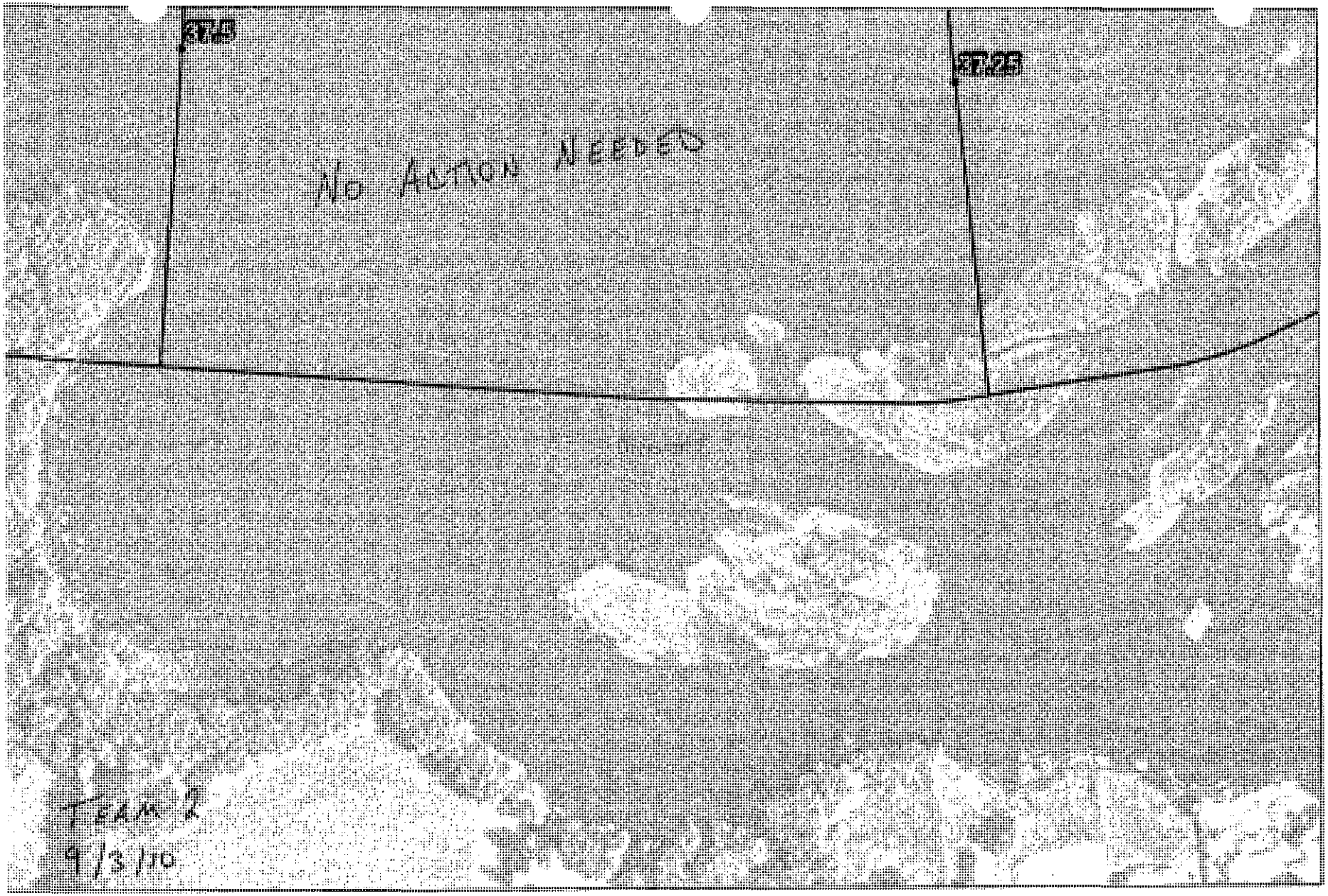
0 75 150 Feet

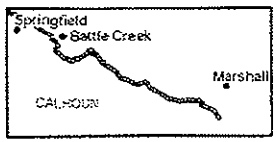
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

37.25-37.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

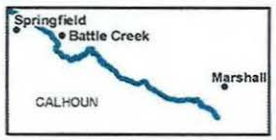
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In. .nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 37.25-37.5 Right Bank While Looking Downstream										
EPA-C-0602	Channel		Light silvery sheen kicked up when boat hit stump. No oil observed. No followup actions needed. Area is delta area of river entering lake. many small islands covered with purple loosestrife out in channel.					No action needed.	42.27779	-85.44392





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 37.25-37.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

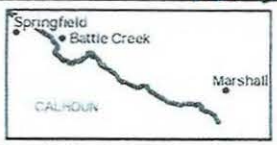
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

SCAT Team 4, 9/1/10, KDB. -- No oil +, No actionable item



Notes: light silver sheen on surface of water. Very sporadic/trace



Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

37.25-37.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA. 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From** 37.25 **Start MP to End MP** 37.50 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From 37.25 Start MP to End MP 37.50 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 37.25 **to MP** 37.50 **Segment Length: 0.25 mile**

1. **SCAT** ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER MAUK	8-31-10 (date)	Enbridge
Signature M J NALIPINSKI	31 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Loan	09/05/2010 (date)	Enbridge	Karen Van Tiem 09-05-10 Karen Van Tiem
Signature Christine R. JUMP	9/6/10 (date)	EPA	Gary A. Andrew 9.5.10 Gary A. Andrew
Signature Kathleen Fairchild	9/5/10 (date)	MDNRE	Chris Conn

5. **EPA**

Signature GARY LIPSON	9/18/10 (date)	EPA Division Supervisor

Appendix E
Photographs

Field Photo Log – Segment MP 37.50



Photo 0158 – Looking southwest at left descending bank.



Photo 0159 – Looking south at left descending bank.



Photo 0160 – Looking southeast at left descending bank.



Photo 0161 – Looking southeast at left descending bank.

Field Photo Log – Segment MP 37.50



Photo 0162 – Looking southeast at left descending bank.



Photo 0163 – Looking east at left descending bank.



Photo 0164 – Looking southeast at left descending bank.



Photo 0165 – Looking southwest at island.



Photo 0166 – Looking south at left descending bank. Near SCE4-9.



Photo 0167 – Looking east at right descending bank.



Photo 0168 – Looking northeast at right descending bank. Near EPA-C-602.



Photo 0169 – Looking northeast at right descending bank.

Field Photo Log – Segment MP 37.50



Photo 0170 – Looking south at island.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 37.75 – MP 37.50 to 37.75

Enbridge Energy

September 17, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 37.75 had no oiling observed on either the left or right descending bank. The overbank contained no areas requiring clean-up and islands were present with no oiling observed. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 37.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 37.5-37.75 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 37.5-37.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

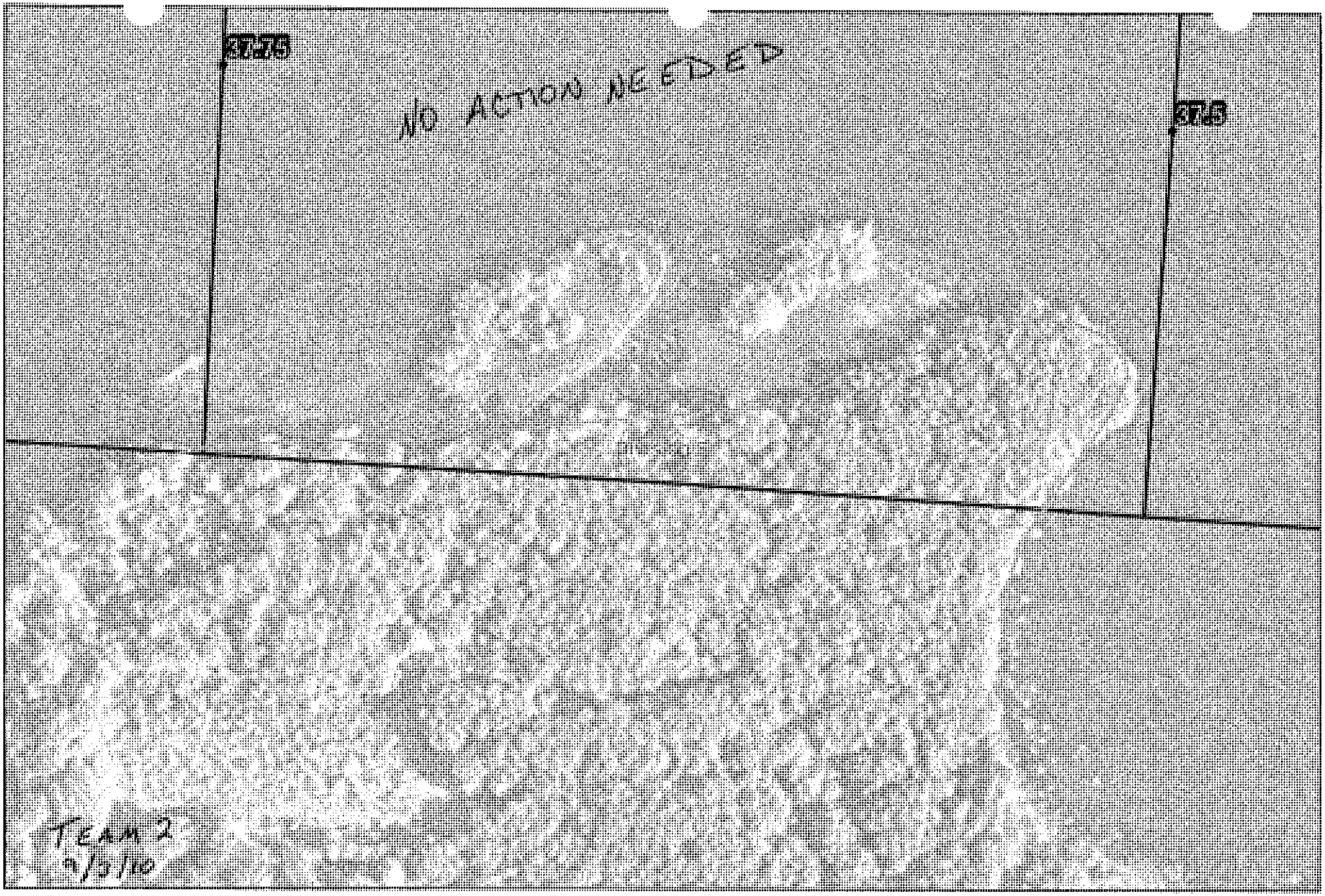
0 75 150 Feet

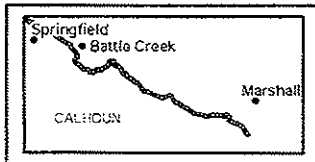
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

37.5-37.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 37.5-37.75 Right Bank While Looking Downstream										
EPA-C-0601	Channel		Light silver sheen on water near bank, mostly in slackwater areas. Very sporadic (<1%). No oil observed. No additional cleanup action needed.					No action needed.	42.27751	-85.44683





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 37.5-37.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

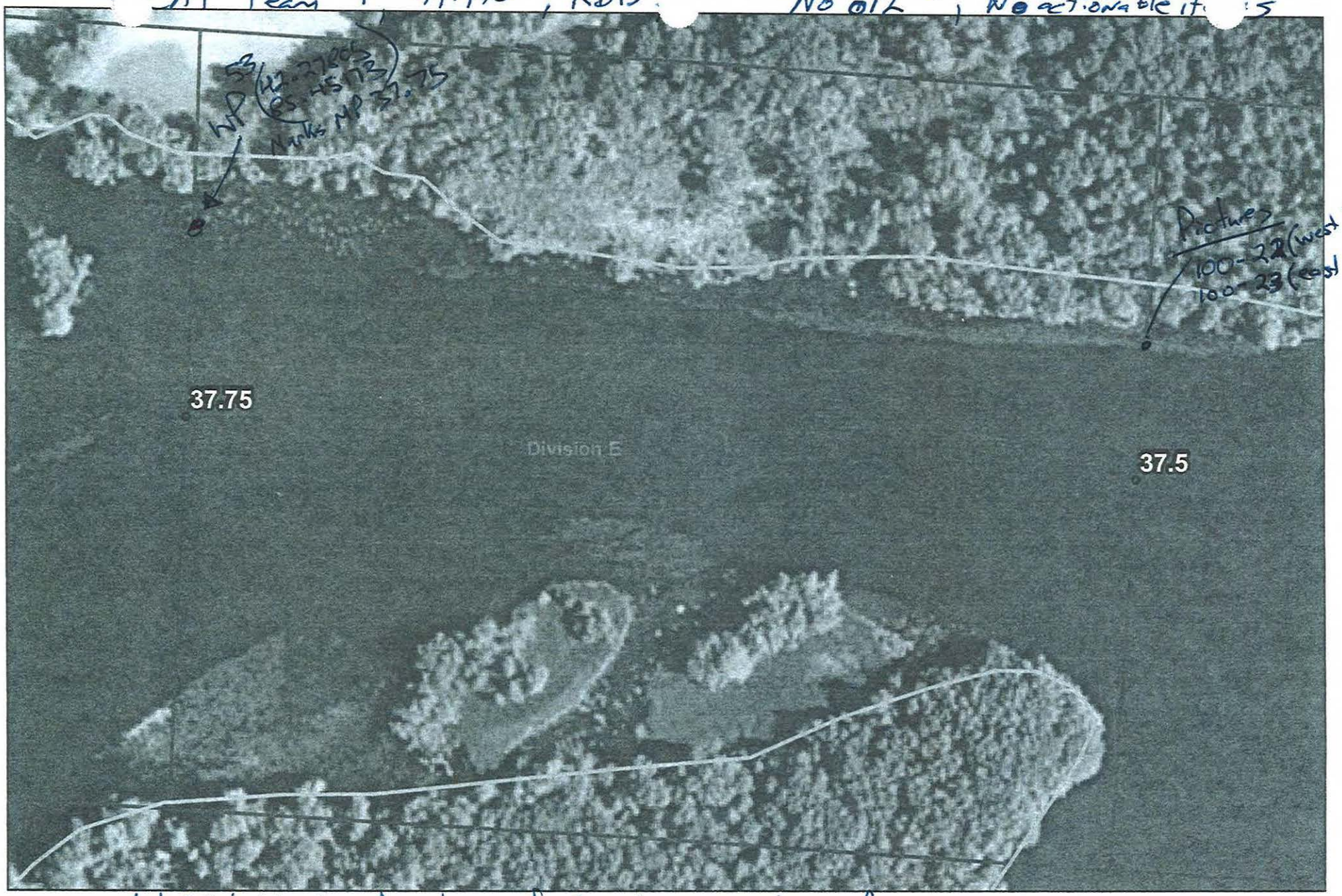
Source: Aerial Photography: USDA, 2009.

ENTRIX

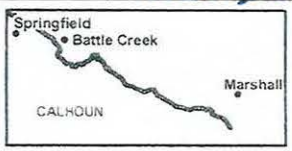
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

CAT Team 4 9/1/10, RDB * No oil *, No actionable it[illegible]s



Notes: light sporadic, traces of silver sheen on water surface



Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

37.5-37.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source Aerial Photography USDA, 2009

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 37.50 **to MP** 37.75 **Segment Length: 0.25 mile**

1. ~~SCAT~~ ☐

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUN	8-31-10 (date)	Enbridge
Signature M J NALIPINSKI	31 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Loan	09/05/2010 (date)	Enbridge Karen VanTiem 09/05/10
Signature Christine R. Jump	9/5/10 (date)	EPA Gary A. Andrew 9.5.10 Gary A. Andrew
Signature Kathleen Fairchild	9/5/10 (date)	MDNRE Chris Conn

5. **EPA**

Signature GARY LIPSON	9/18/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0147 – Looking southwest at left descending bank.



Photo 0148 – Looking east at left descending bank.



Photo 0149 – Looking northeast at island.



Photo 0150 – Looking east at island.



Photo 0151 – Looking east at right descending bank.



Photo 0152 – Looking northeast at right descending bank.



Photo 0153 – Looking east at right descending bank.



Photo 0154 – Looking northeast at right descending bank. Near EPA-C-0601.



Photo 0155 – Looking southwest at left descending bank/island.



Photo 0156 – Looking west at island.

Field Photo Log – Segment MP 37.75



Photo 0157 – Looking south at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 38.00 – MP 37.75 to 38.00

Enbridge Energy

September 19, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 38.00 had no oiling on the left descending bank and only sporadic oiled vegetation and one pool of oil observed on the right descending bank. An island was present with no observed oil. The overbank contained no areas of oil requiring clean-up. There were no problematic areas that required special considerations.

Actions

The shoreline clean-up activities within Segment 38.00 consisted of the following:

- Removal of oiled vegetation leaving roots intact;
- Manual removal of pooled oil (shoreline only).

Outcome

Clean-up recommendations have been addressed and no remaining oiling conditions were observed. Segment 38.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial and sketch map)
    - Island/Sandbar
      - Operations Cleanup Recommendation Table
      - Figures (aerial)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (aerial)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank-Reassessment Conclusions Table
    - Island/Sandbar-Reassessment Conclusions Table
    - Right Descending Bank-Reassessment Conclusions Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

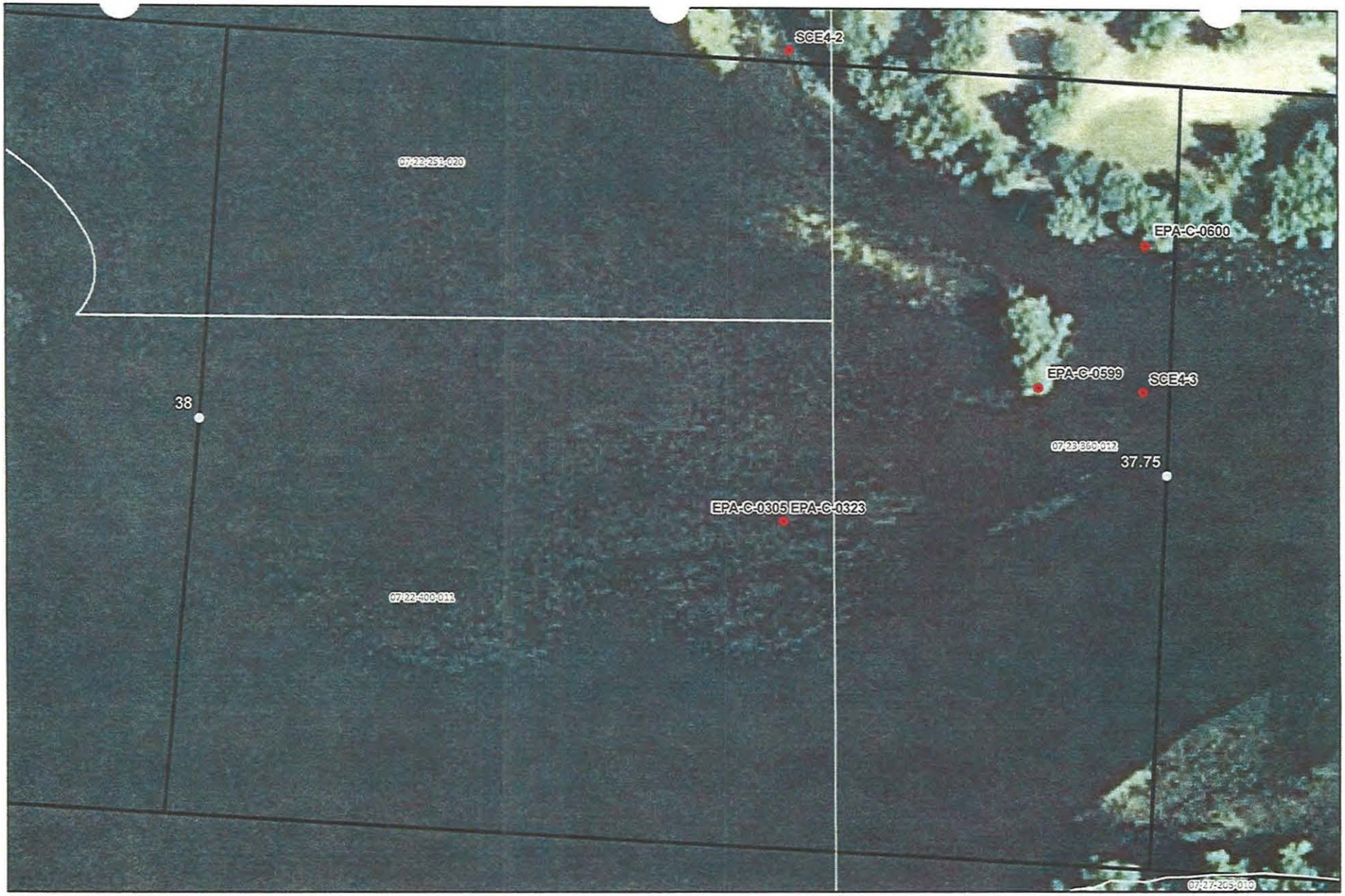
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

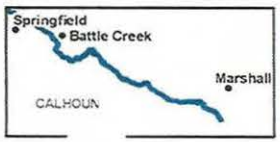
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... ...t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 37.75-38.0 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 37.75-38
Left Bank While Looking Downstream

Enbridge [illegible]line Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

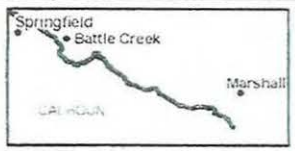
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane M[illegible] South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

37.75-38

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75150
Feet

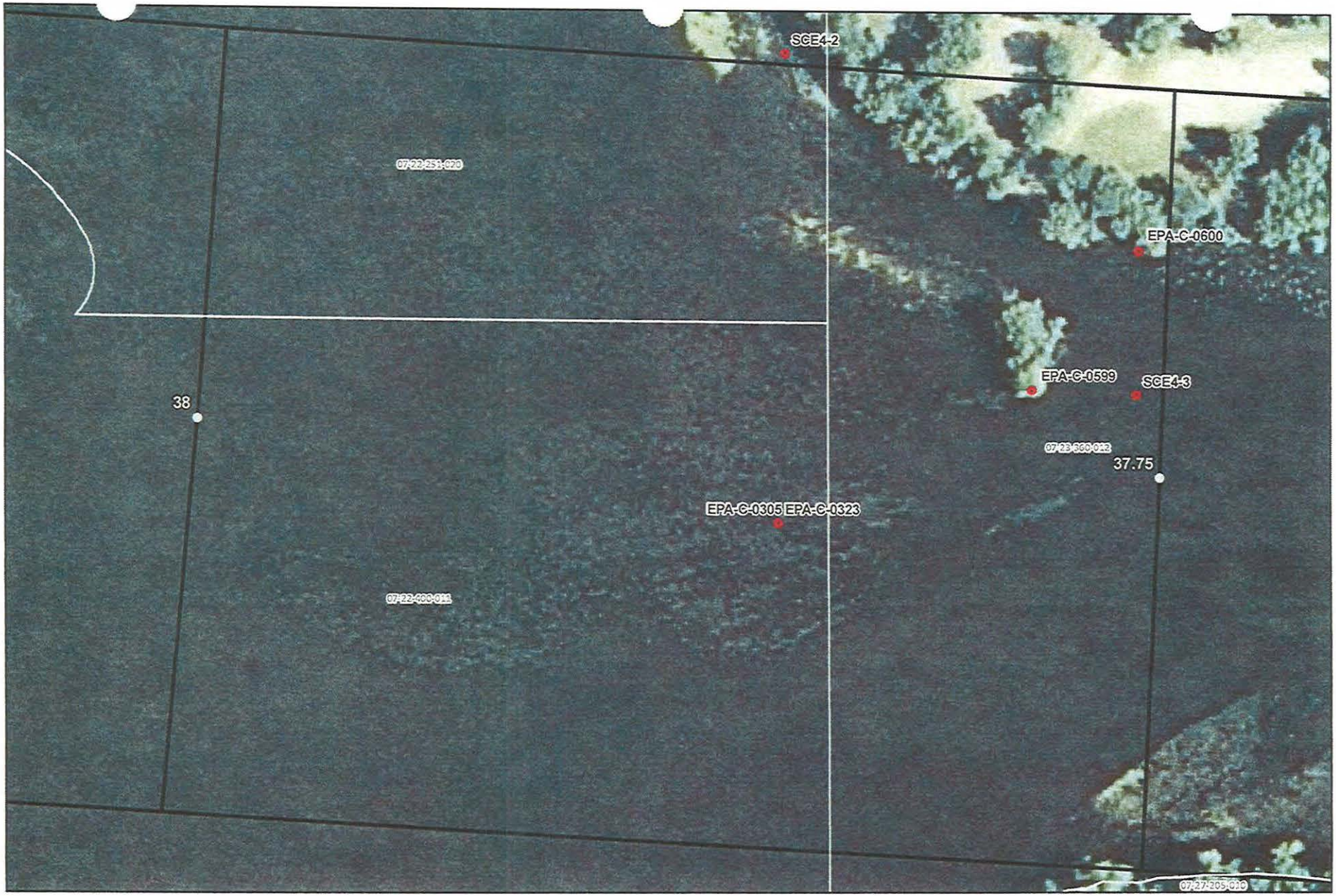
Source: Aerial Photography: USDA, 2009

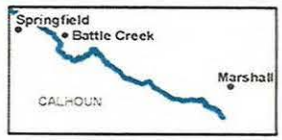
ENTRIX

Enbridge Pipeline Release In... ...t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 37.75-38.0 Island										
EPA-C-0600	Channel	SCAT T4 09/02/2010	Sporadic (<1%) traces of silver sheen on water near RDB. No oil observed on bank or overbank in this section. No follow up actions needed.					No action needed.	42.27805	-85.45173
EPA-C-0599	Channel	SCAT T4 09/02/2010	No oil detected on island. island covered with trash. no follow up actions needed.					No action needed.	42.27751	-85.45226





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 37.75-38 Island

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

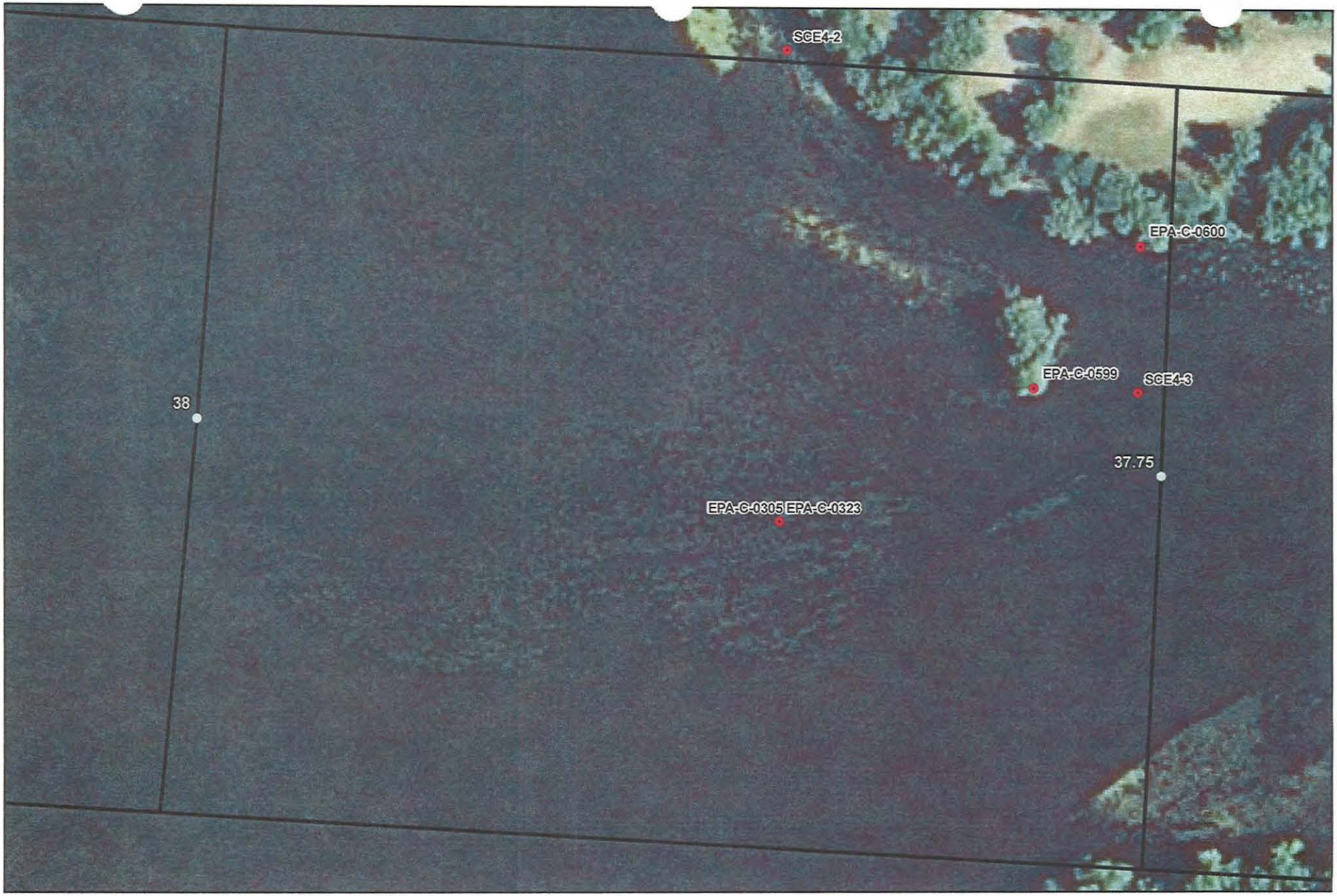
ENTRIX

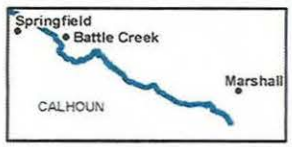
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 37.75-38.0 Right Bank While Looking Downstream										
SCE4-2	Shoreline	Shoreline Assessment	*				Oil sheen seems below island booms. Island area silver sheen 12" long; w/ small tarballs < 10% sheen		42.278767	-85.453533
EPA-C-0305	Shoreline	SCAT T3 08/28/2010							42.27700	-85.45354
EPA-C-0323	Shoreline and Overbank	SCAT T3 08/28/2010	Within ten feet of already cleared area, oil becomes sporadic. Clear vegetation that contains oil only. One pool of oil is located in center (length wise) and manual removal is recommended. On previously cleared area, some stained soil still remains					Clear vegetation that contains oil only. One pool of oil is located in center (length wise) and manual removal is recommended.	42.27700	-85.45354





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 37.75-38
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill

OPERATIONS INSPECTION REPORT (OIR)

Date: 11-Sept-10 Time: AM / PM

Operations Division: E Segment ID: From 37.5 Start MP to End MP 38.0 Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/ 55°F

Field Inspection Team

Enbridge Inspector: Dar Deeen.

Division Supervisor(Contractor): STEVE TURNER

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

✓

No Recommendations

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

✓

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

SCB 4-2 marked green.

EPA-C-0323 could not find. In the middle of the lake.

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

✓

No Recommendations.

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9-11-10 **Time: AM / PM**

Operations Division: E **Segment ID: From** 37.75 **Start MP to End MP** 38.0 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/ Rain

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): [signature]

SCAT Reviewed – Description of Clean Up Required

Reviewed the SCAT report: the LDB required No Action, Island required No Action.
RDB - EPA-C-0323 showed to be in the middle of the lake according to the GPS points. And SCE 4-2 is Loam Maintance.

Clean Up Performed – Description of Clean Up Complete

☑ **SCAT Requirements/Clean Up Complete**

Inspected this Section and all Clean up is Complete according to the SCAT report

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

None

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 37.75-38.0 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Latitude	Longitude	SCAT Reassessment Satisfactory?
Division E: Mile Marker 37.75-38.0 Island										
EPA-C-0600	SCAT T4 09/02/2010	Sporadic (<1%) traces of silver sheen on water near RDB. No oil observed on bank or overbank in this section. No follow up actions					No action needed.	42.27805	-85.45173	(Y) / N
EPA-C-0599	SCAT T4 09/02/2010	No oil detected on island. island covered with trash. no folllow up actions needed.					No action needed.	42.27751	-85.45226	(Y) / N

Printed Team Members Names: Dana Strouse ROSS DELROSARIO, USEPA

Date: 9-13-10 Glenn VanDenWater NRD 9/13/10

Comments:

SCAT REASSESSMENT CONCLUSIONS

ID	Feature	Source	Flushing	Pooled Oil	Vegetation	Debris	Comment	Latitude	Longitude	SCAT
Division E: Mile Marker 37.75-38.0 Right Bank While Looking Downstream										
SCE4-2	Shoreline Assessment	-				Oil sheen seems below island booms. Island area silver sheen 12" long; w/ small tarballs < 10% sheen		42.278767	-85.453533	(Y) N
EPA-C-0305	SCAT T3 08/28/2010							42.27700	-85.45354	(Y) / N
* EPA-C-0323	SCAT T3 08/28/2010	Within ten feet of already cleared area, oil becomes sporadic. Clear vegetation that contains oil only. One pool of oil is located in center (length wise) and manual removal is recommended. On previously cleared area, some stained soil still remains a					Clear vegetation that contains oil only. One pool of oil is located in center (length wise) and manual removal is recommended.	42.27700	-85.45354	(Y) / N

Printed Team Members Names: Dana Strouse, ROSS DEL ROSARIO, USEPA

Date: 9-13-10

Comments: * Did not find EPA-C-0323

Glenn VANDEWATER NRC 9/13/10

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From** 37.75 **Start MP to End MP** 38.0 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection** → See separate form

Signature _____ (date) _____ Enbridge

Signature _____ (date) _____ EPA

4. **SCAT Reassessment**

Glenn VanderWater 9/13/10
Signature Glenn VanderWater (date) Enbridge

R. del Rosario 9/13/10
Signature ROSS DELROSARIO (date) EPA

Dana Strouse 9/13/10
Signature Dana Strouse (date) MDNRE

was signed by all three representatives after the step 3 inspections

5. **EPA**

Gary Lipson 9/20/10
Signature GARY LIPSON (date) EPA Division Supervisor

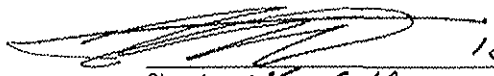
Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 32.75 to MP 38.00 Segment Length: 0.25 mile

1. **SCAT** ☑

2. **Clean up** ☑

3. **Inspection**



13-Sept-2010 Enbridge
Signature Ron Costley (date)

Eduardo Rovira 9/13/10 EPA
Signature (date)
Eduardo Rovira

4. **SCAT Reassessment**

_____ Enbridge
Signature (date)

_____ EPA
Signature (date)

_____ MDNRE
Signature (date)

5. **EPA**

_____ EPA Division Supervisor
Signature (date)

Appendix E
Photographs



Photo 0523 – Looking northeast at right descending bank, near EPA-C-0600.



Photo 0524 – Looking west at island, near SCE4-3.



Photo 0525 – Looking northwest at island, near EPA-C-0599.



Photo 0526 – Looking northeast at island, near EPA-C-0599.



Photo 0527 – Looking north at right descending bank, near SCE4-2.



Photo 0528 – Looking northeast at right descending bank, near SCE4-2.



Photo 0529 – Looking north at right descending bank.



Photo 0530 – Looking northwest at right descending bank.



Photo 0531 – Looking northwest at right descending bank.



Photo 0532 – Looking west at right descending bank.



Photo 0533 – Looking southwest at left descending bank.



Photo 0534 – Looking southwest at left descending bank.



Photo 0535 – Looking south at left descending bank.



Photo 0536 – Looking southeast at left descending bank.



Photo 0537 – Looking south at left descending bank.



Photo 0538 – Looking west at left descending bank.



Photo 0539 – Looking southwest at left descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 38.25– MP 38.00 to 38.25

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 38.25 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations:

Outcome

No oiled conditions exist. Segment 38.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

able 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

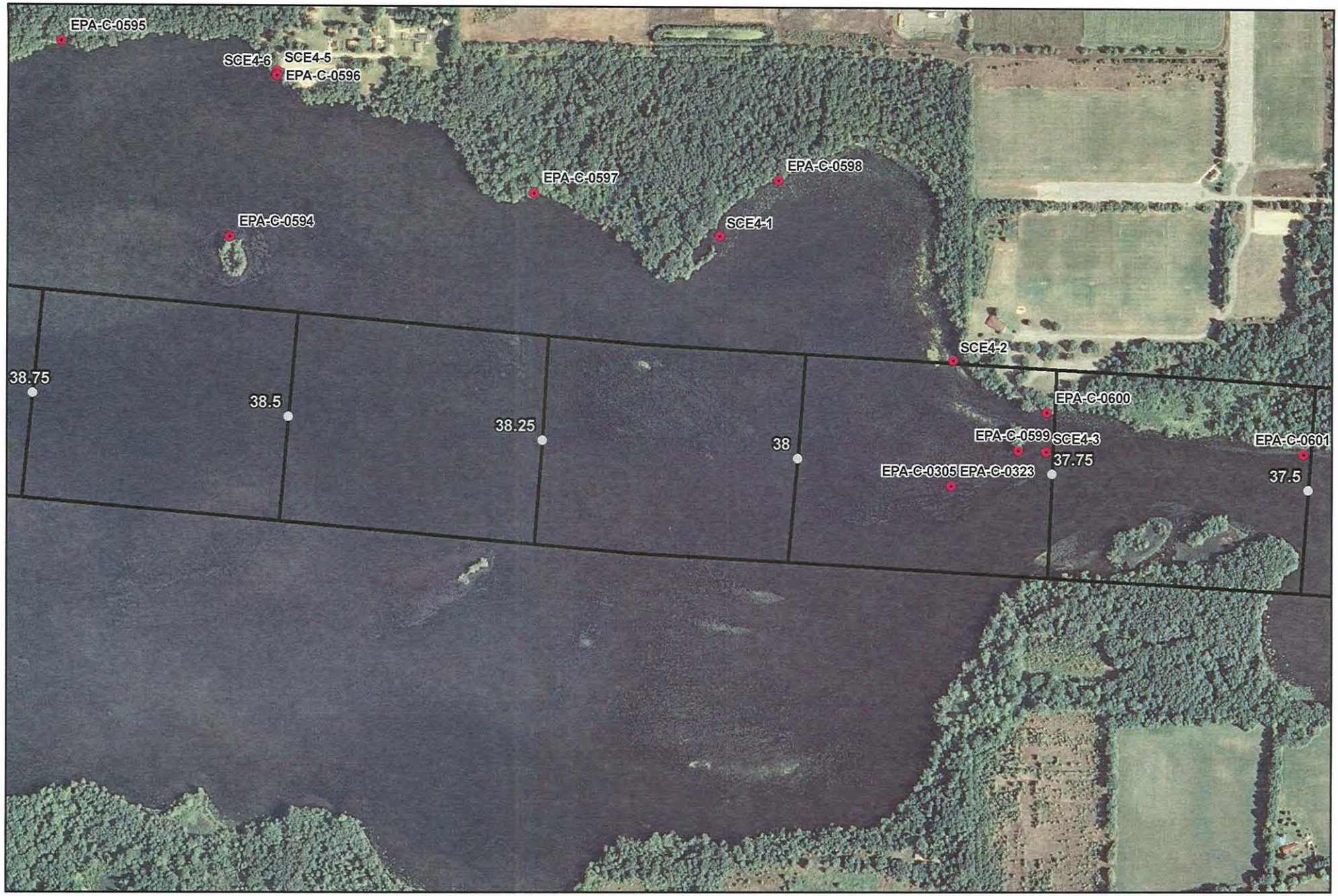
Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 38.0-38.25 Right Bank While Looking Downstream										
SCE4-1	Shoreline	Shoreline Assessment	•				Small oil sheen (6"x2"). Broken up when touched. Bio? Likely not petroleum		42.280467	-85.458033





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B BC C D E F G H NO OIL UNKNOWN ZONE

Division E: Mile Marker 38-38.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 250 500 Feet

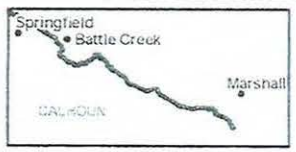
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

38-38.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75150
Feet

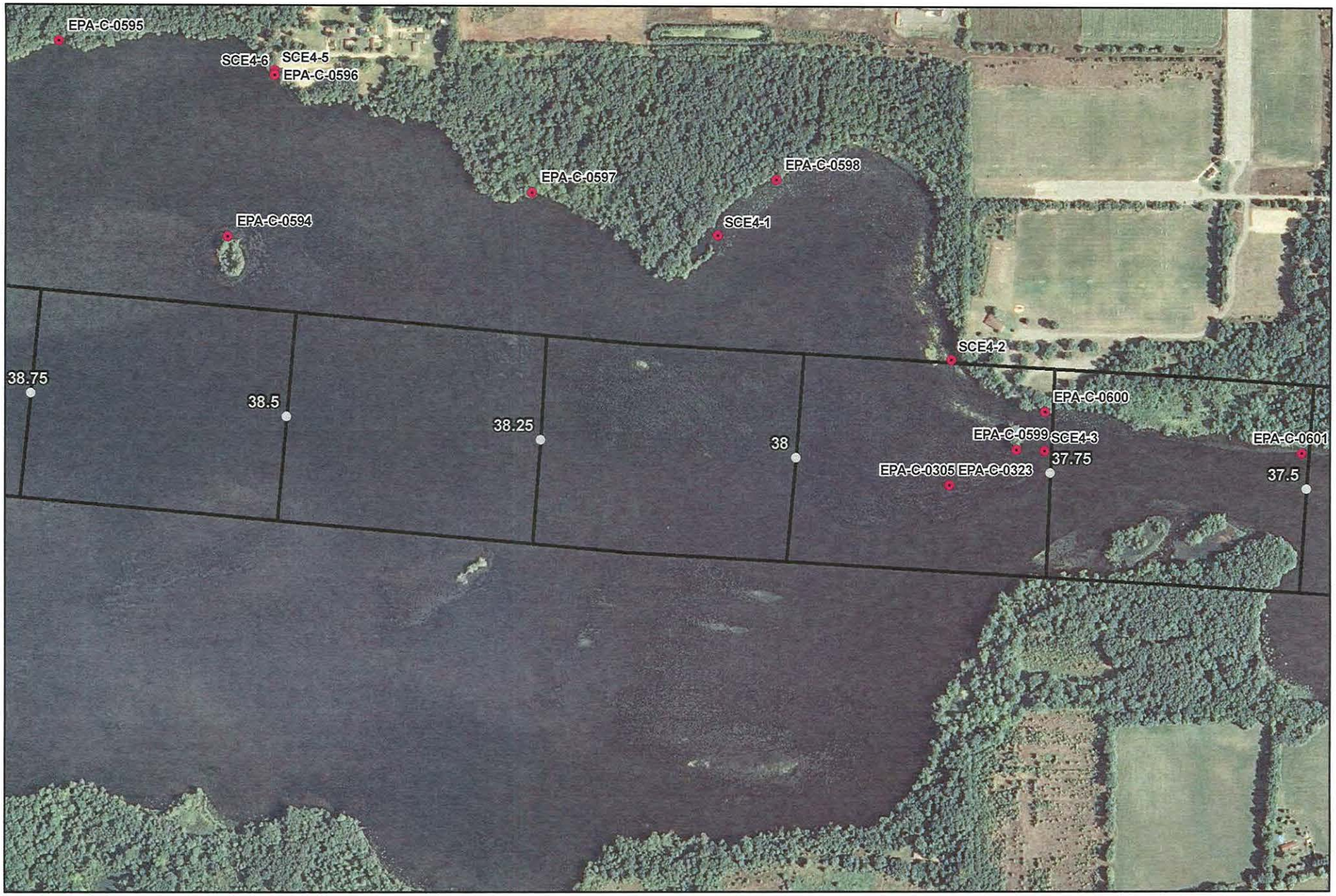
Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In... ...t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 38.0-38.25 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area
A B BC C D E F G H NO OIL UNKNOWN ZONE

Division E: Mile Marker 38-38.25
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 250 500 Feet

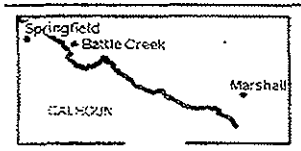
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

TEAM 3
LDB

Sept. 1, 2010

38-38.25

Enbridge Pipe' lease Incident - Kalamazoo River Oil Spill

0 7515O
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate Syste 1983 State
Plane Michigan

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 38.00 **to MP** 38.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature	(date)	
CHRISTOPHER HAUG	8-31-10	Enbridge
MJ NALEPINSKI	31 Aug '10	EPA

4. **SCAT Reassessment**

Signature	(date)		
Michael Van Loan	09/05/2010	Enbridge	Pamela E. Rice 9/5/10 Pamela E. RICE
Gary A. Andrew	9.5.10	EPA	Michelle Kerr 09.05.10 MICHELLE KERR
Christopher Clampitt	9/5/10	MDNRE	

5. **EPA**

Signature	(date)	
	9/14/10	EPA Division Supervisor

Appendix E
Photos



Photo 0138 – Looking southwest at left descending bank.



Photo 0140 – Looking east at left descending bank.



Photo 0144 – Looking southeast at left descending bank.



Photo 0145 – Looking southwest at left descending bank.



Photo 0216 – Looking east at right descending bank.



Photo 0217 – Looking east at right descending bank.



Photo 0218 – Looking south at right descending bank. Near SCE4-1.



Photo 0219 – Looking north at right descending bank. Near SCE4-1.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 38.50– MP 38.25 to 38.50

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 38.50 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations:

Outcome

No oiled conditions exist. Segment 38.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

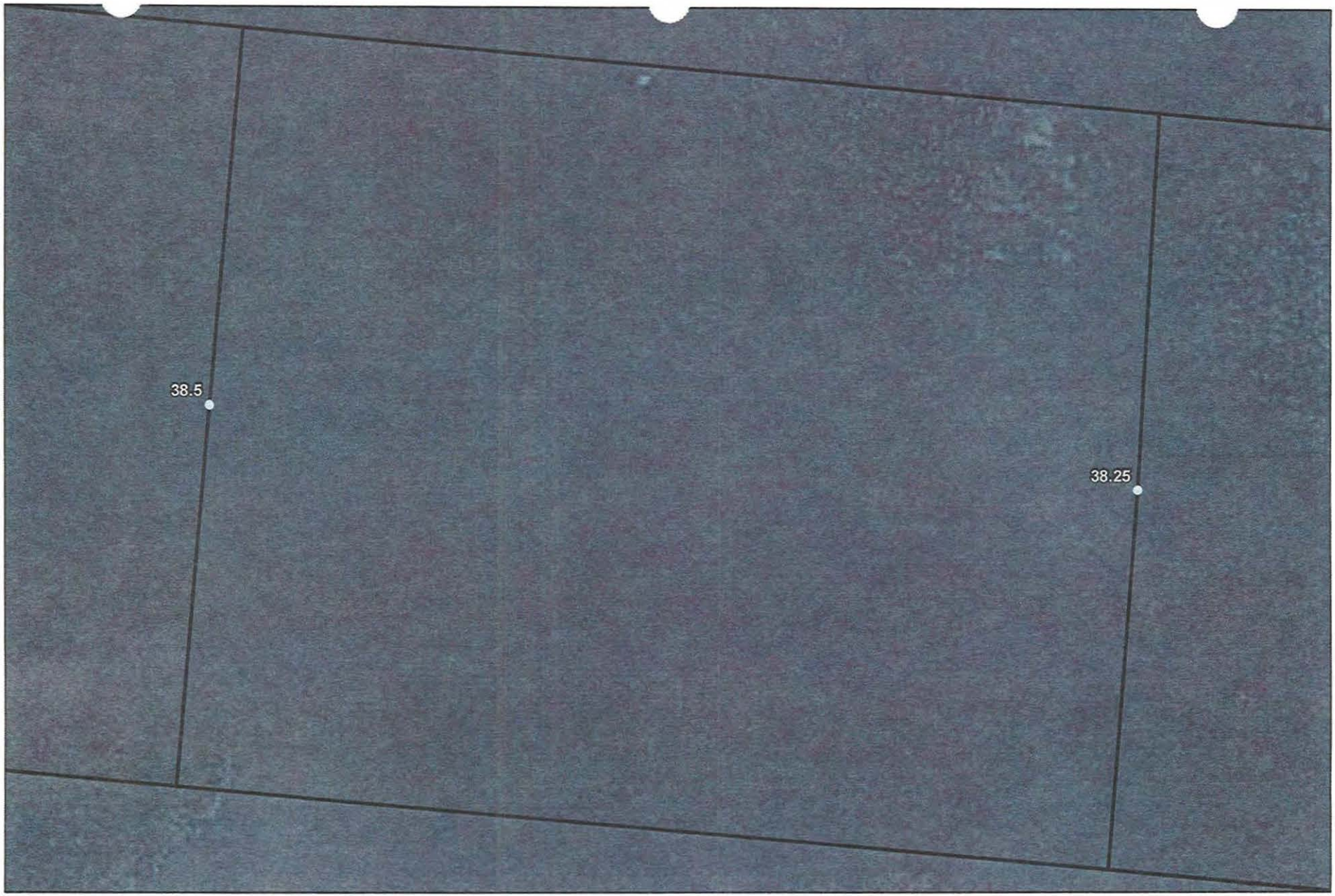
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

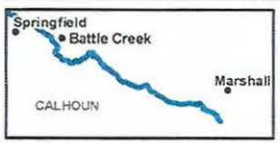
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 38.25-38.5 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 38.25-38.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

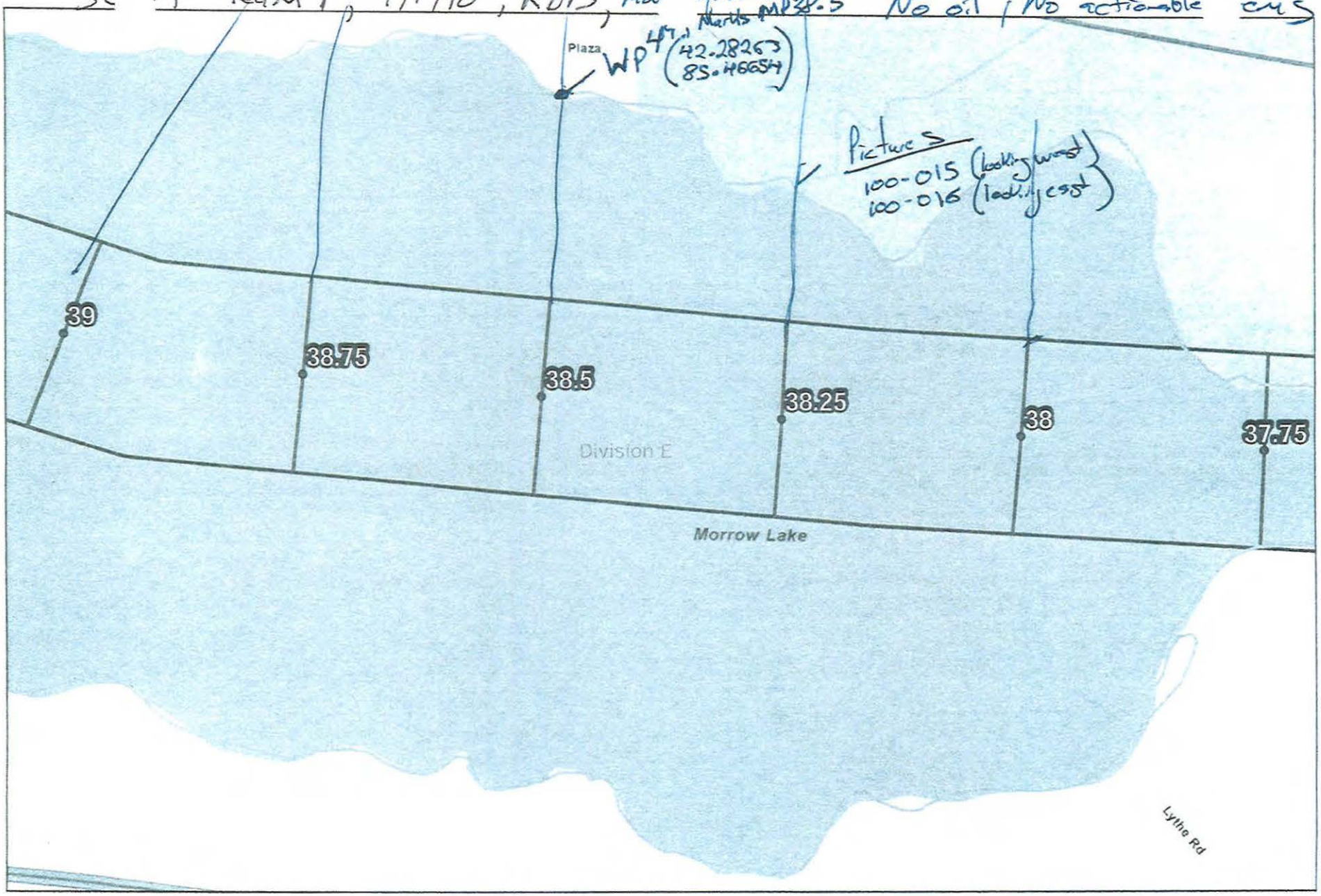
0 75 150 Feet

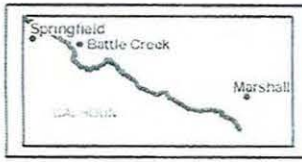
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

38.25-38.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 7.5 15 30
Feet

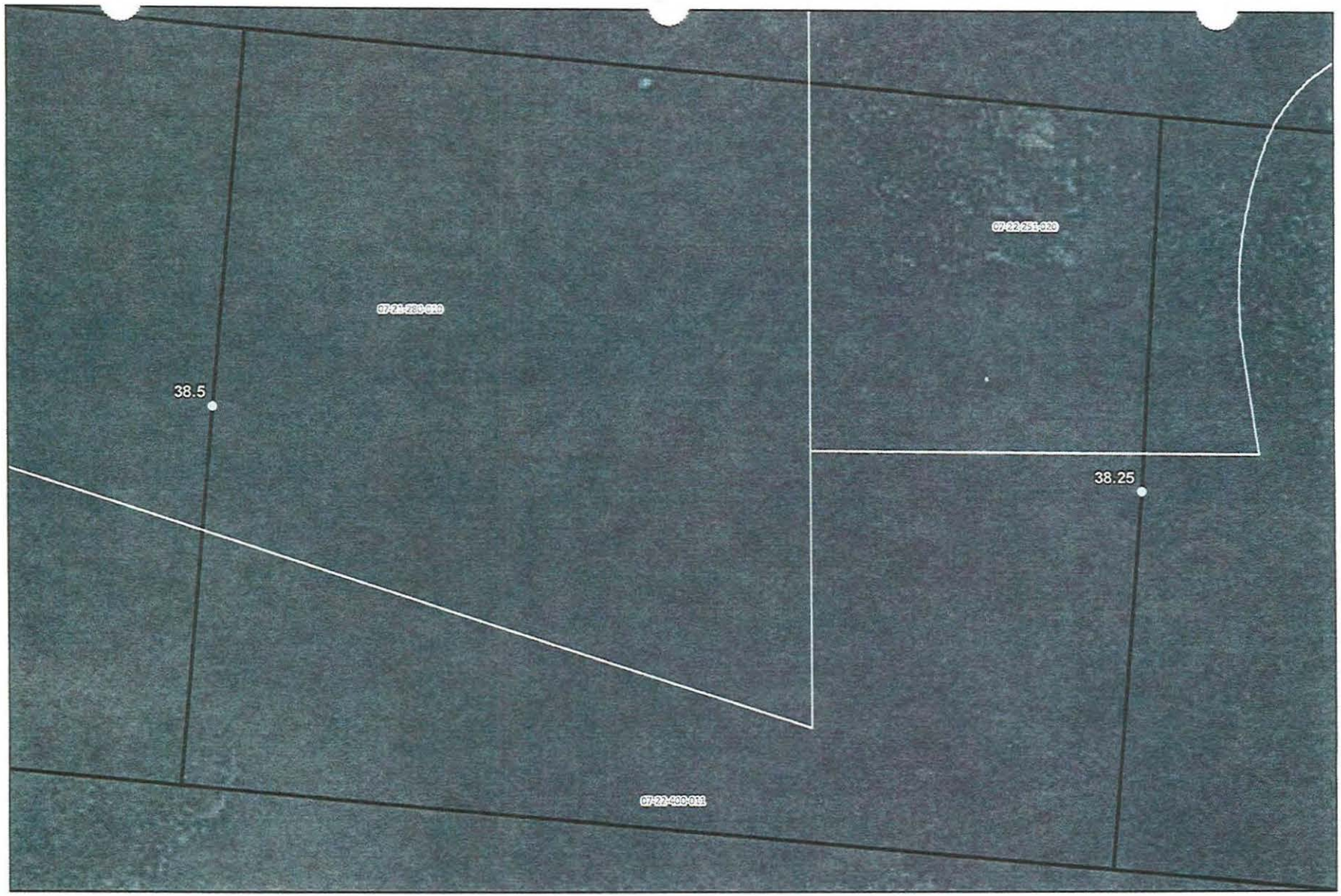
Source: Aerial Photography: USDA, 2009.

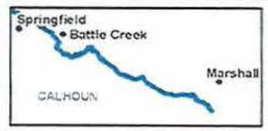
ENTRIX

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 38.25-38.5 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 38.25-38.5
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography. USDA. 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E. **Segment ID: From MP** 38.25 **to MP** 38.50 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER MAUK	8-31-10 (date)	Enbridge	
Signature M J NALEPINSKI	31 Aug '10 (date)	EPA	

4. **SCAT Reassessment**

Signature Michael Van Loan	09/05/2010 (date)	Enbridge	Pamela E. Rice 9/5/10 Pamela E. RICE
Signature Gary A. Andrew	9.5.10 (date)	EPA	Michelle Keer 09.05.10 MICHELLE KEER
Signature Christopher Clampit	9/5/10 (date)	MDNRE	

5. **EPA**

Signature	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 38.50



Photo 0137 – Looking southeast at left descending bank.



Photo 0142 – Looking northeast at left descending bank.

Field Photo Log – Segment MP 38.50



Photo 0143 – Looking southeast at left descending bank.



Photo 0209 – Looking southeast at island.



Photo 0210 – Looking east at island.



Photo 0211 – Looking northeast at island.



Photo 0212 – Looking northeast at right descending bank.



Photo 0213 – Looking northeast at right descending bank.

Field Photo Log – Segment MP 38.50



Photo 0214 – Looking east at right descending bank.

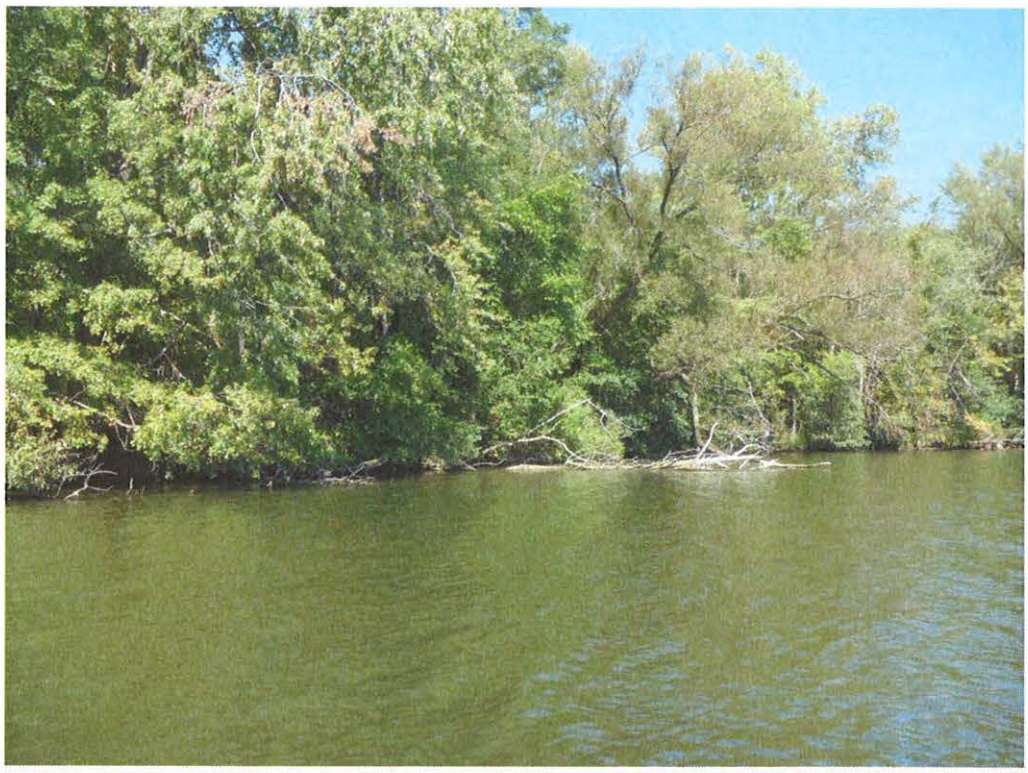


Photo 0215 – Looking northeast at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 38.75– MP 38.50 to 38.75

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 38.75 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations:

Outcome

No oiled conditions exist. Segment 38.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Opcrations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

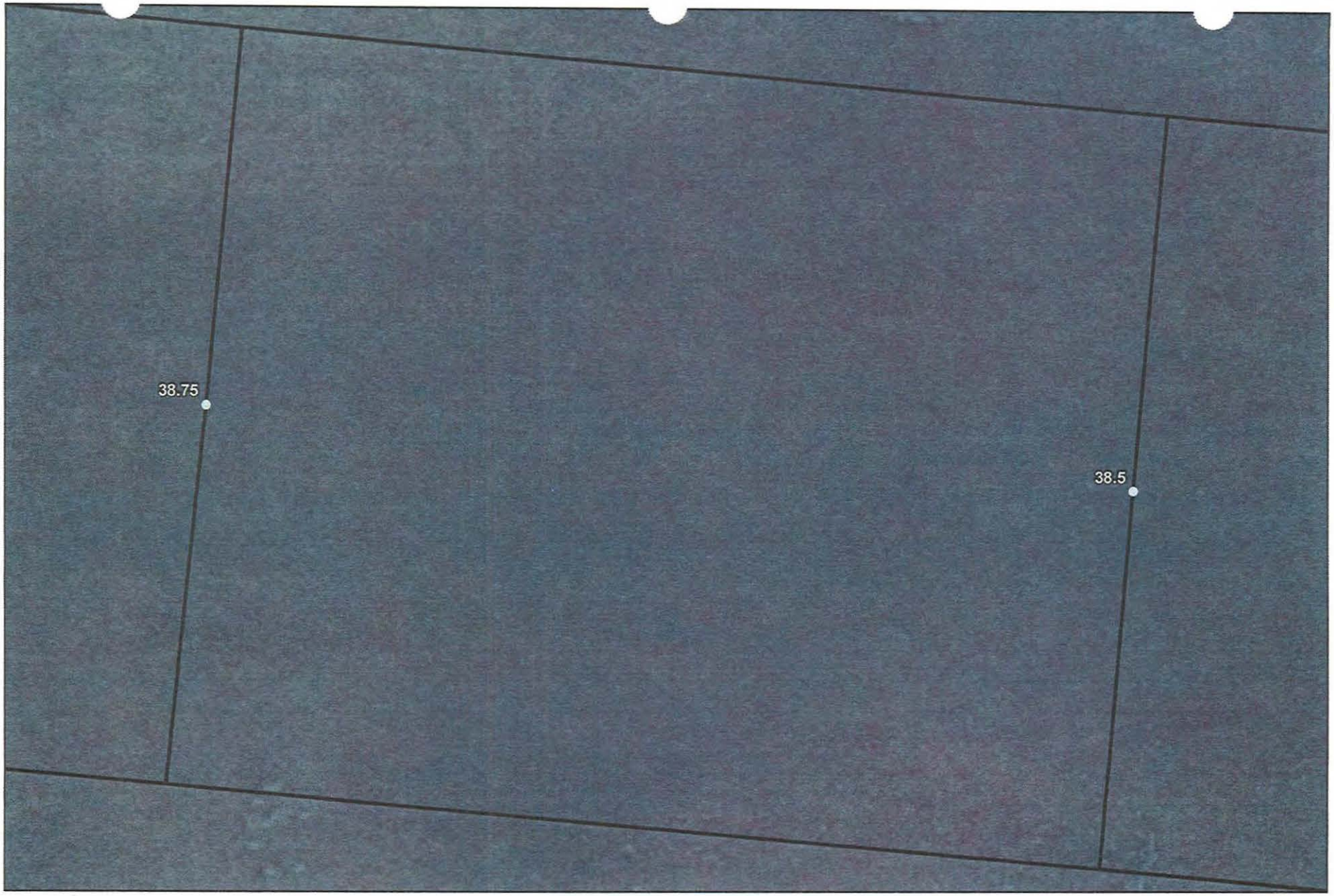
Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

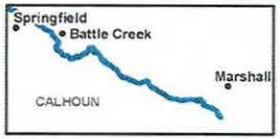
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 38.5-38.75 Right Bank While Looking Downstream										
SCE4-5	Shoreline	Shoreline Assessment					Reference point only. Finished main pool of Morrow Lake.	No action needed.	42.2827	-85.466533





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 38.5-38.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

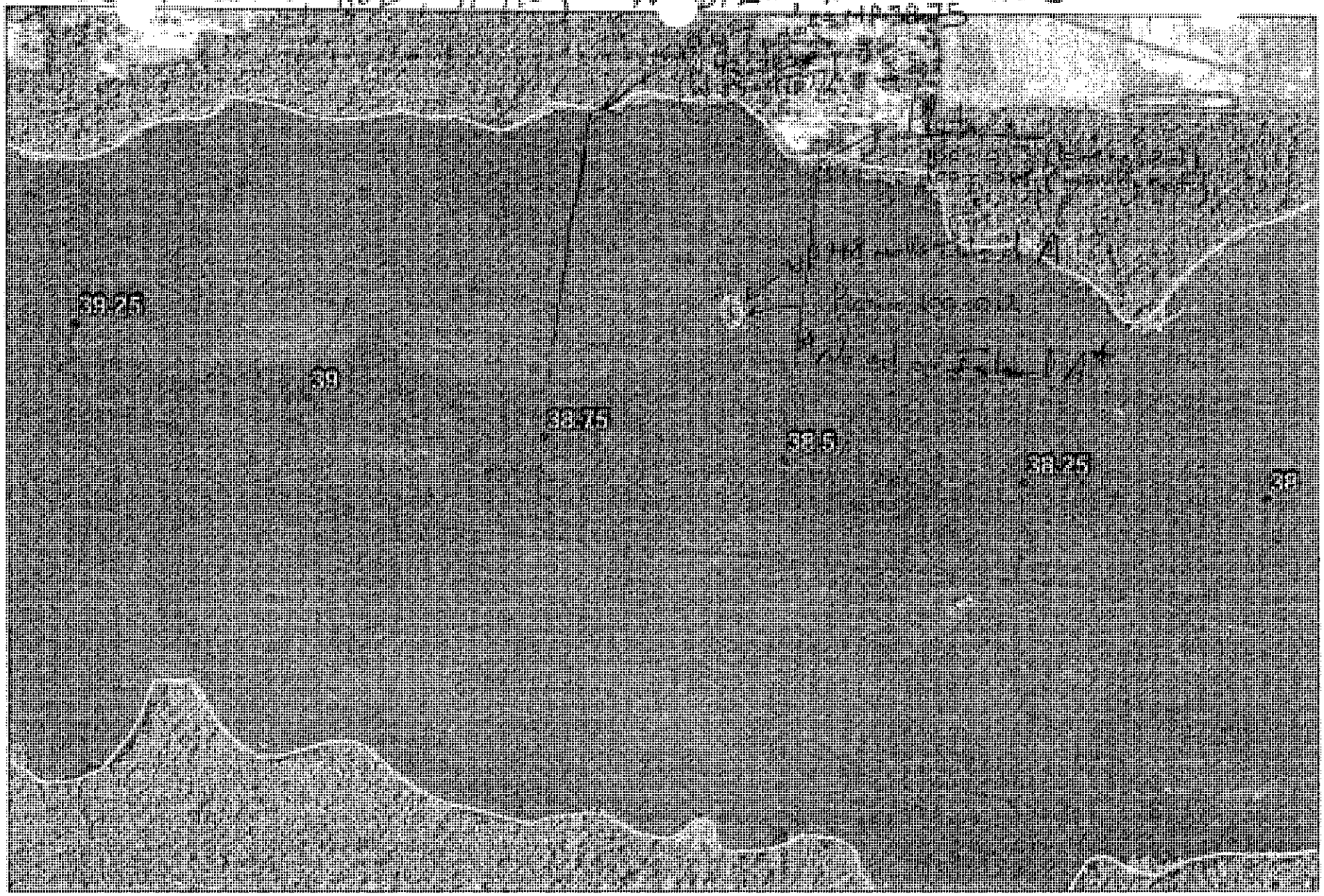
0 75 150 Feet

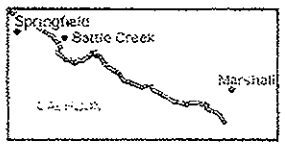
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

38.5-38.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 7.5 15 30
Feet

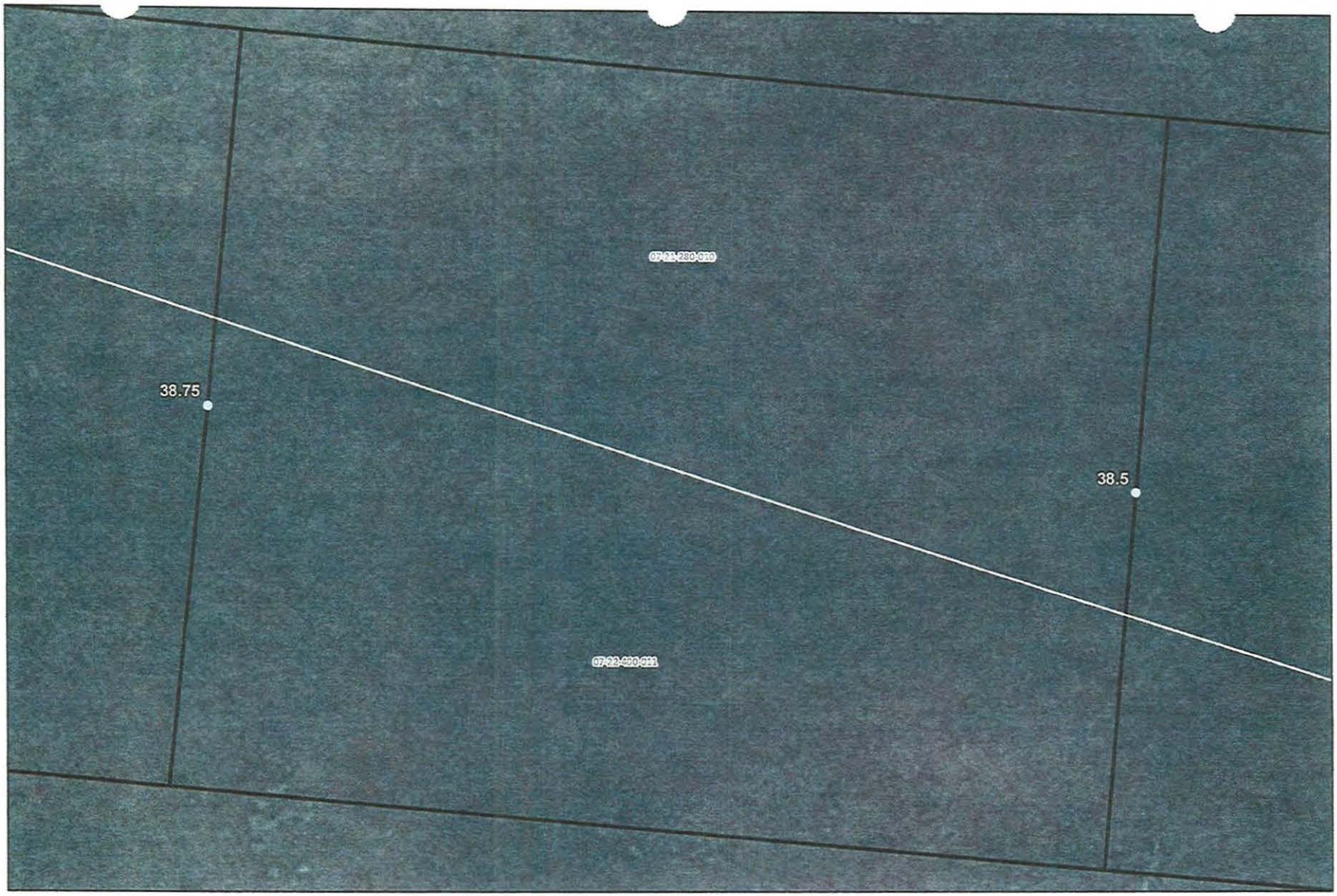
Source: Aerial Photography USDA, 2009.

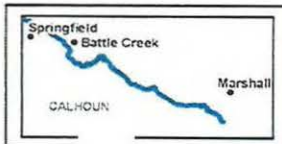
ENTRIX

Enbridge Pipeline Release In... ...t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 38.5-38.75 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 38.5-38.75
Left Bank While Looking Downstream

Enbridge [illegible]line Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane M[illegible] South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

SCAT Assessment determined that no cleanup operations were necessary.

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 38.50 **to MP** 38.75 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUX	8-31-10 (date)	Enbridge	
Signature M J NALEPINSKI	31 Aug '10 (date)	EPA	

4. **SCAT Reassessment**

Signature Michael Van Loan	09/05/2010 (date)	Enbridge	Pamela E. Rice 9/5/10 Pamela E. Rice
Signature Gary A. Andia	9.5.10 (date)	EPA	Michelle Kerr 09.05.10 MICHELLE KERR
Signature Christopher Clampit	9/5/10 (date)	MDNRE	

5. **EPA**

Signature GARY LIDSON	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 38.75



Photo 0132 – Looking southeast at left descending bank.



Photo 0133 – Looking southwest at left descending bank

Field Photo Log – Segment MP 38.75



Photo 0134 – Looking southeast at left descending bank.



Photo 0135 – Looking east at left descending bank.

Field Photo Log – Segment MP 38.75



Photo 0136 – Looking south at left descending bank.



Photo 0203 – Looking northeast at right descending bank.

Field Photo Log – Segment MP 38.75



Photo 0204 – Looking northeast at right descending bank.



Photo 0205 – Looking east at right descending bank.



Photo 0206 – Looking south at island.



Photo 0207 – Looking east at island.

Field Photo Log – Segment MP 38.75



Photo 0208 – Looking northwest at island.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 39.00 – MP 38.75 to 39.00

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 39.00 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations:

Outcome

No oiled conditions exist. Segment 39.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

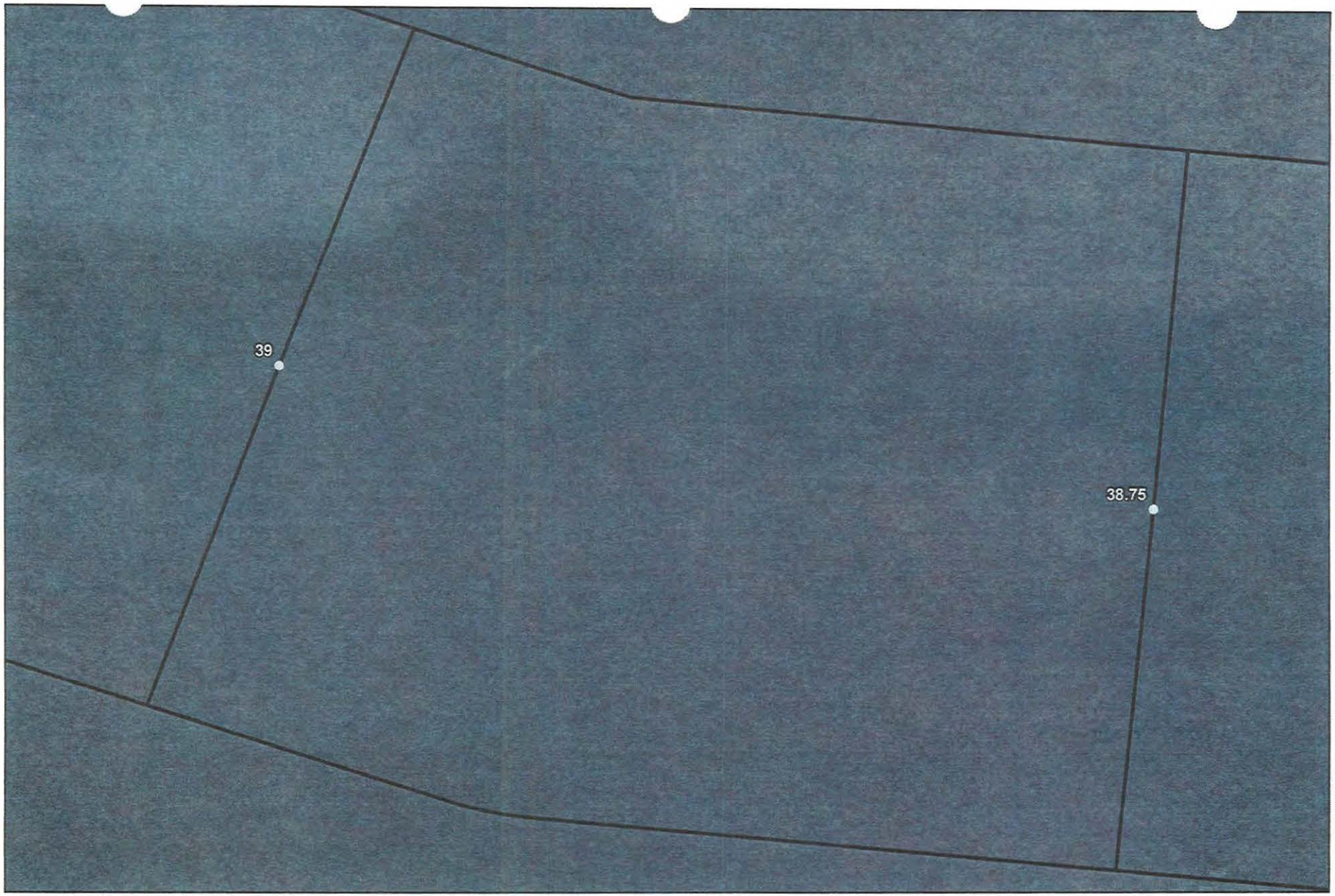
*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In.. .it - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 38.75-39.0 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 38.75-39
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

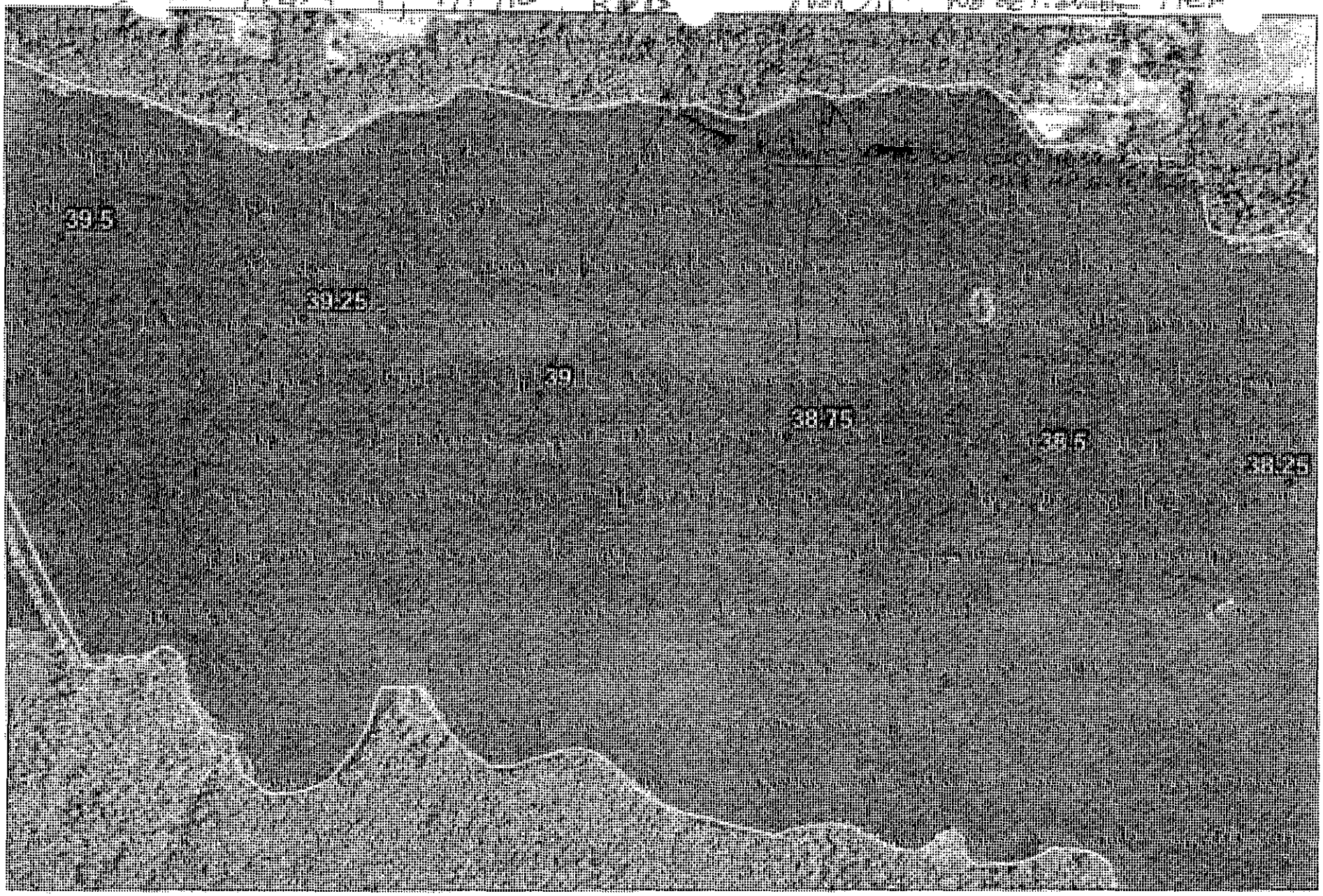
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

SCAT Team 4, 9/1/10, RDB *No Oil*, No actionable item





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

38.75-39

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

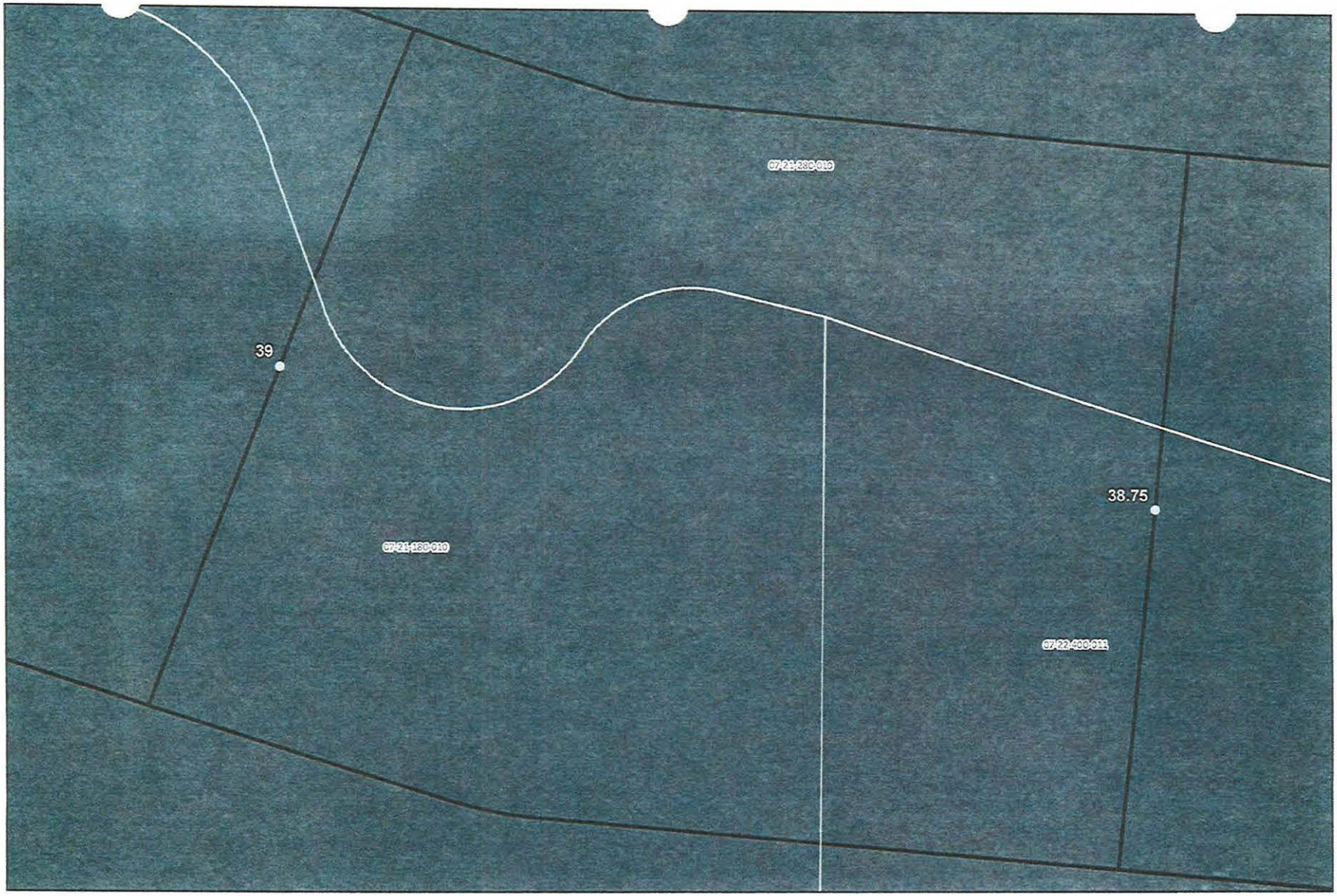
0 75 150
Feet

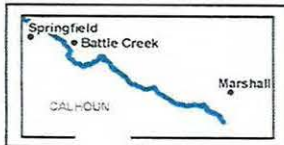
Source: Aerial Photography: USDA, 2009.

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 38.75-39.0 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 38.75-39
Left Bank While Looking Downstream

Enbridge [illegible]eline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane M[illegible] South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From**_____ **Start MP to End MP**_____ **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Revised 8/29/10

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 38.75 **to MP** 39.00 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAUK	8-31-10 (date)	Enbridge
Signature MJ MALCPIASKI	31 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Loan	09/05/2010 (date)	Enbridge	Pamela E. Rice 9/5/10 Pamela E. RICE
Signature Gary A Andrew	9.5.10 (date)	EPA	Michelle Kerr 09.05.10 MICHELLE KERR
Signature Christopher Clampitt	9/5/10 (date)	MDNRE	

5. **EPA**

Signature	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos

Field Photo Log – Segment MP 39.00

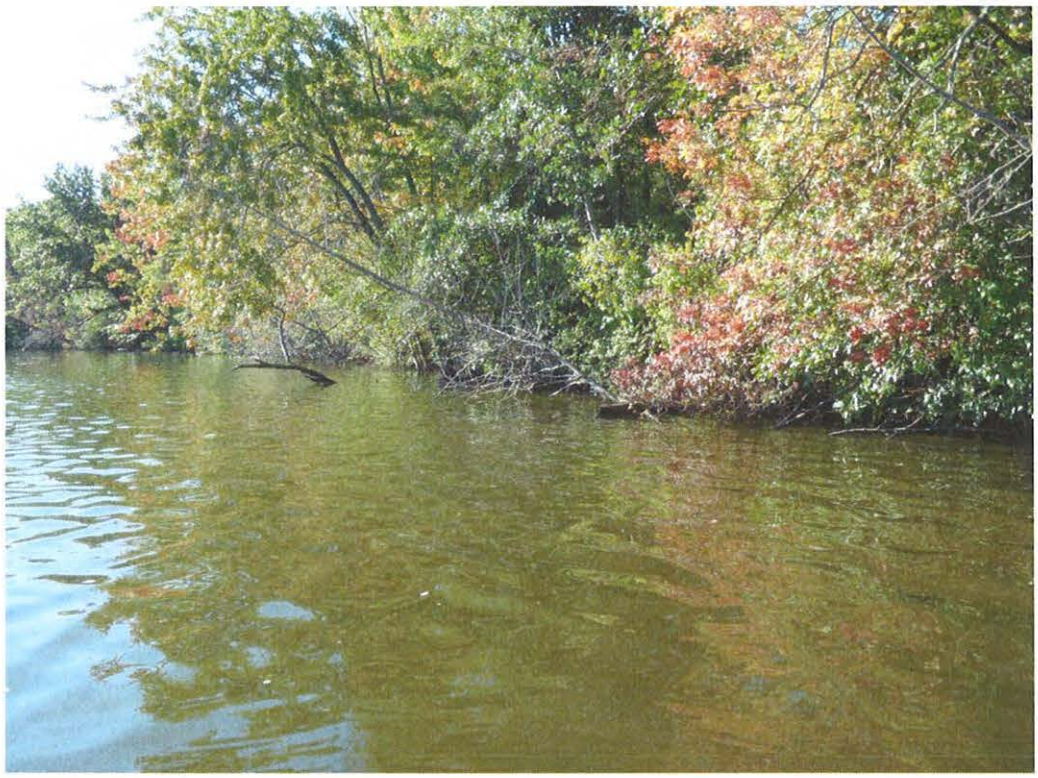


Photo 0127– Looking southeast at left descending bank.



Photo 0128 – Looking southwest at lower descending bank.



Photo 0129 – Looking east at left descending bank.



Photo 0130 – Looking south at left descending bank.

Field Photo Log – Segment MP 39.00



Photo 0131– Looking south at left descending bank.



Photo 0200 – Looking northeast at right descending bank.

Field Photo Log – Segment MP 39.00



Photo 0201 – Looking northeast at right descending bank



Photo 0202 – Looking north at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 39.25 – MP 39.00 to 39.25

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 39.25 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations:

Outcome

No oiled conditions exist. Segment 39.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
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B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
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AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
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PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

able 2.

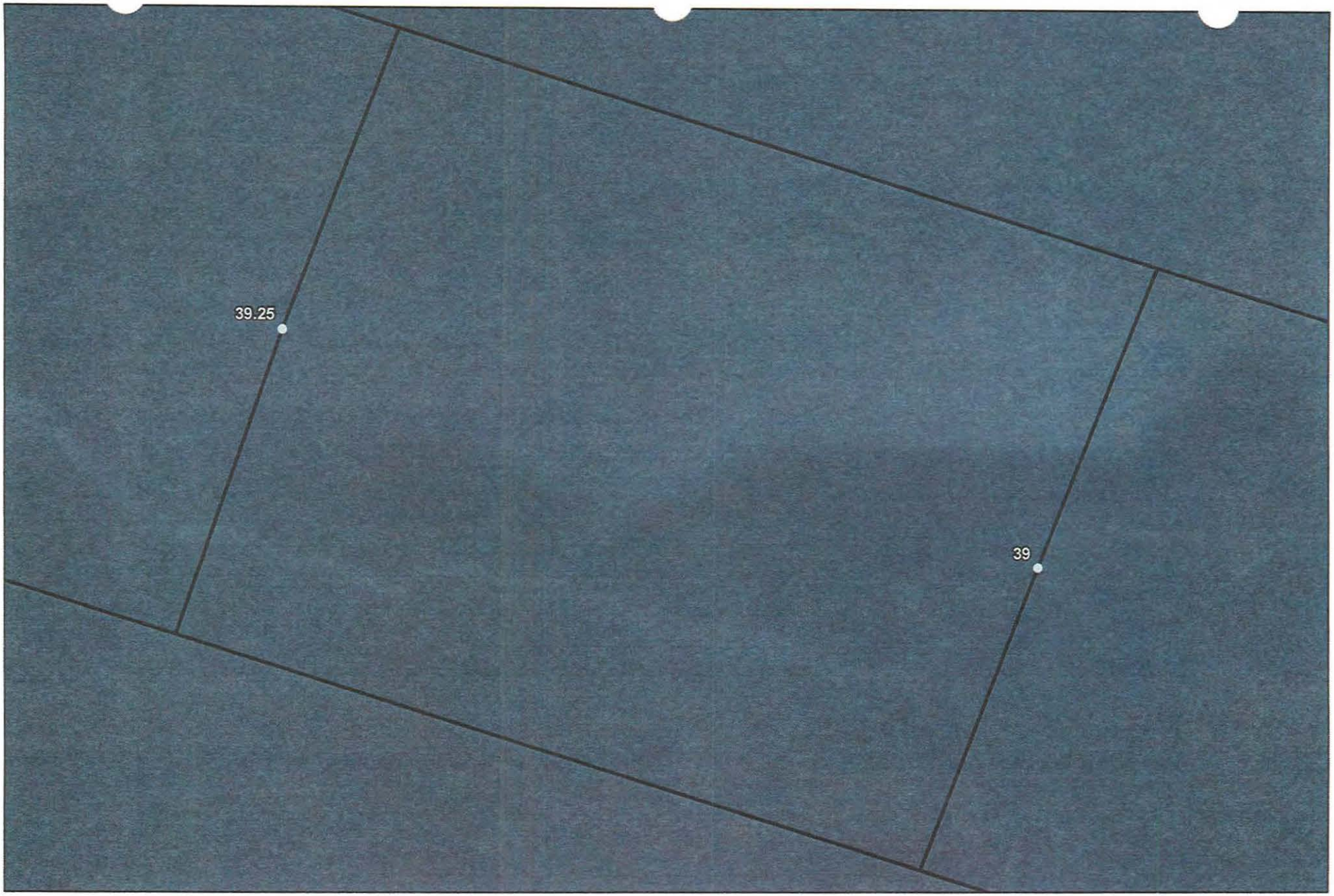
Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

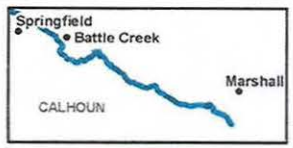
Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 39.0-39.25 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 39-39.25
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

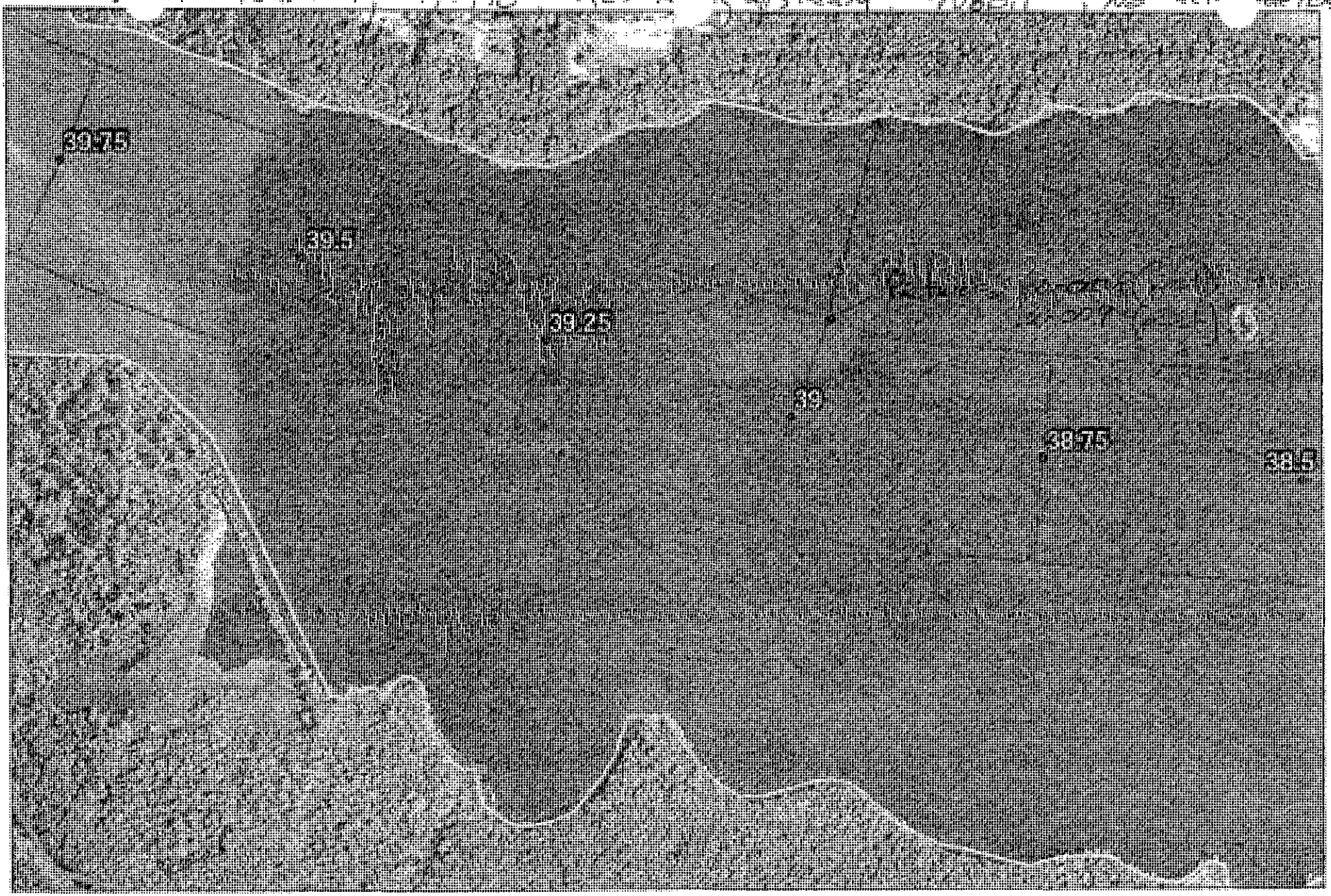
0 75 150
Feet

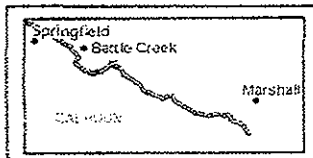
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

39-39.25

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 7.5 15 30
Feet

Source: Aerial Photography, USDA, 2009.

ENTRIX

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island** **Overbank: LOB/ROB**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From**_____ **Start MP to End MP**_____ **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 39.00 **to MP** 39.25 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

8-31-10 Enbridge
Signature CHRISTOPHER HAUX (date)

31 Aug '10 EPA
Signature MJ MALINSKI (date)

4. **SCAT Reassessment**

09/05/2010 Enbridge Pamela E. Rice 9/5/
Signature Michael Van Loan (date) Pamela E. RICE

9.5.10 EPA Michelle Kerr 09.05.
Signature Gary A Anderson (date) MICHELLE KERR

9/5/10 MDNRE
Signature Christopher Clempitt (date)

5. **EPA**

9/14/10 EPA Division Supervisor
Signature (date)

Appendix E
Photos



Photo 0123 – Looking southeast at left descending bank.



Photo 0124 – Looking southeast at left descending bank.



Photo 0125– Looking southwest at left descending bank.



Photo 0126 – Looking east at left descending bank.



Photo 0196 – Looking northeast at right descending bank.



Photo 0197– Looking northeast at right descending bank.



Photo 0198 – Looking east at right descending bank.



Photo 0199 – Looking northeast at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 39.50 – MP 39.25 to 39.50

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 39.50 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations:

Outcome

No oiled conditions exist. Segment 39.50 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... ...t - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 39.25-39.5 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 39.25-39.5
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

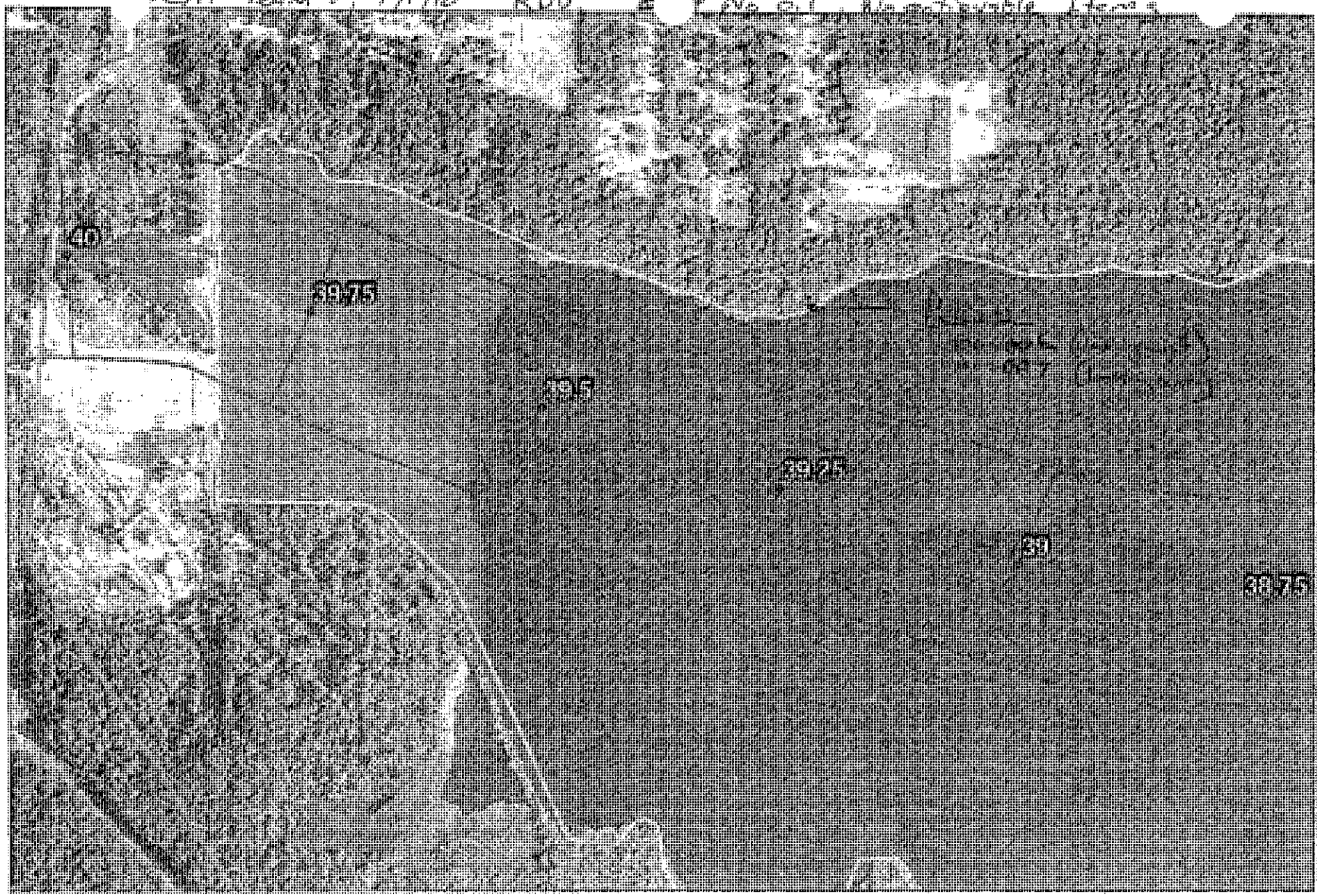
Source: Aerial Photography: USDA, 2009.

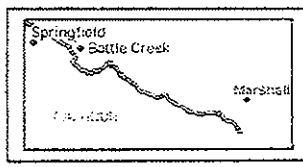
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

SCAT Team 4, 9/1/10 RDB





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

39.25-39.5

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

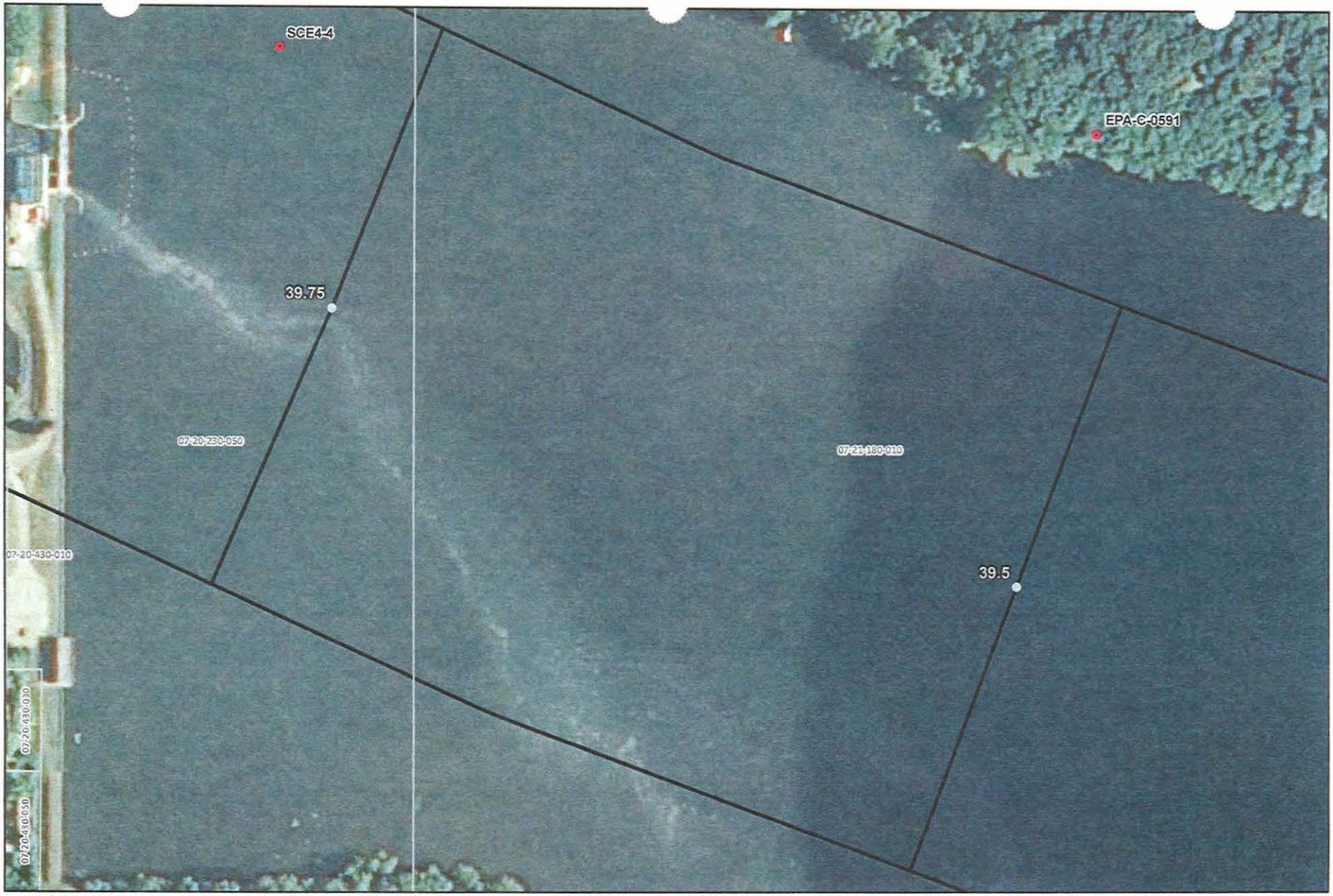
0 75 150
Feet

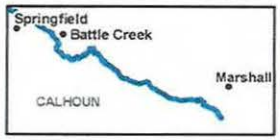
Source: Aerial Photography: USDA, 2009

ENTRIX

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 39.25-39.5 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 39.5-39.75
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ SCAT Requirements/Clean Up Complete or NA

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ **Time: AM / PM**

Operations Division:_____ **Segment ID: From**_____ **Start MP to End MP**_____ **Segment Length: 0.25 mile**

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor/Contractor: _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 39.25 **to MP** 39.50 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

8-31-10 Enbridge
Signature CHRISTOPHER HAUX (date)

M J Nalipinski 31 Aug '10 EPA
Signature M J NALIPINSKI (date)

4. **SCAT Reassessment**

09/05/2010 Enbridge Pamela E. Rice 9/5/10
Signature Michael Van Loan (date) Pamela E. RICE

9.5.10 EPA Michelle Kerr 09.05.10
Signature Gary A. Anjus (date) MICHELLE KERR

9/5/10 MDNRE
Signature Christopher Clampitt (date)

5. **EPA**

9/14/10 EPA Division Supervisor
Signature (date)

Appendix E
Photos

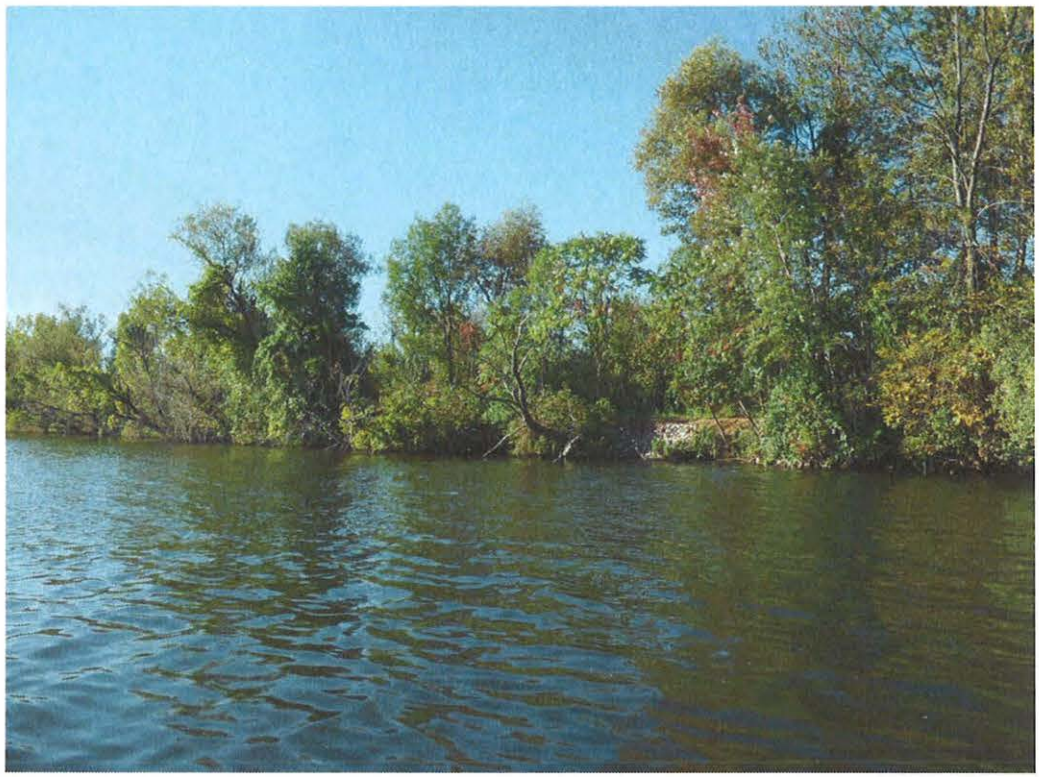


Photo 0119 – Looking south at left descending bank.



Photo 0120 – Looking south at left descending bank.



Photo 0121 – Looking south at left descending bank.



Photo 0122 – Looking south at left descending bank.



Photo 0192 – Looking east at right descending bank.



Photo 0193 – Looking east at right descending bank.



Photo 0194 – Looking northeast at right descending bank.



Photo 0195 – Looking northeast at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 39.75 – MP 39.50 to 39.75

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of Segment 39.75 had no oiling on the left descending bank and no oiling on the right descending bank. The overbank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that required special considerations.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill Clean-up Recommendations Methods. There were no problematic areas that required special considerations

Outcome

No oiled conditions exist. Segment 39.75 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, inciplent asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

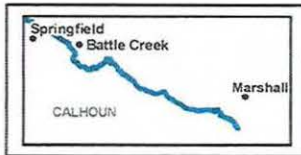
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In.. ..it - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 39.5-39.75 Right Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 39.5-39.75
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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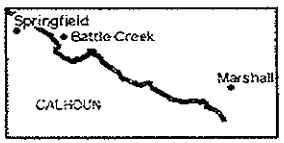
Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

Team 3 : 9/01/10
39.5-39.75

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
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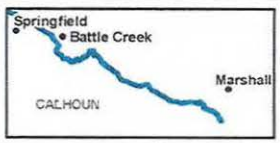
Coordinate System: NAD 1983 State Plane Michigan South Feet

Enbridge Pipeline Release In... ...it - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 39.5-39.75 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 39.75-40
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

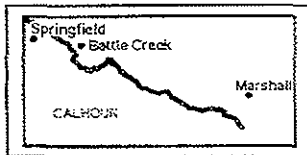
Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

Team 3 : 9/01/10
39.75-40

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ **Island**

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Reviewed – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION **Operations Division:** E **Segment ID: From MP** 39.50 **to MP** 39.75 **Segment Length: 0.25 mile**

1. **SCAT** ☒

2. **Clean up** ☒

3. **Inspection**

Signature CHRISTOPHER HAUX	8-31-10 (date)	Enbridge	
Signature MJ NALIPINSKI	31 Aug '10 (date)	EPA	

4. **SCAT Reassessment**

Signature	09/05/2010 (date)	Enbridge	Pamela E. Rice 9/5/10 Pamela E. RICE
Signature Gary Andrew	9.5.10 (date)	EPA	Michelle Kerr 09.5.10 MICHELLE KERR
Signature Christopher Clampitt	9/5/10 (date)	MDNRE	

5. **EPA**

Signature GARY LIPSON	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0115 – Looking southwest at left descending bank..



Photo 0116 – Looking southeast at left descending bank.



Photo 0117 – Looking southeast at left descending bank.



Photo 0118 – Looking south at left descending bank.



Photo 0189– Looking east at right descending bank.



Photo 0190 – Looking east at right descending bank.

Field Photo Log – Segment MP 39.75

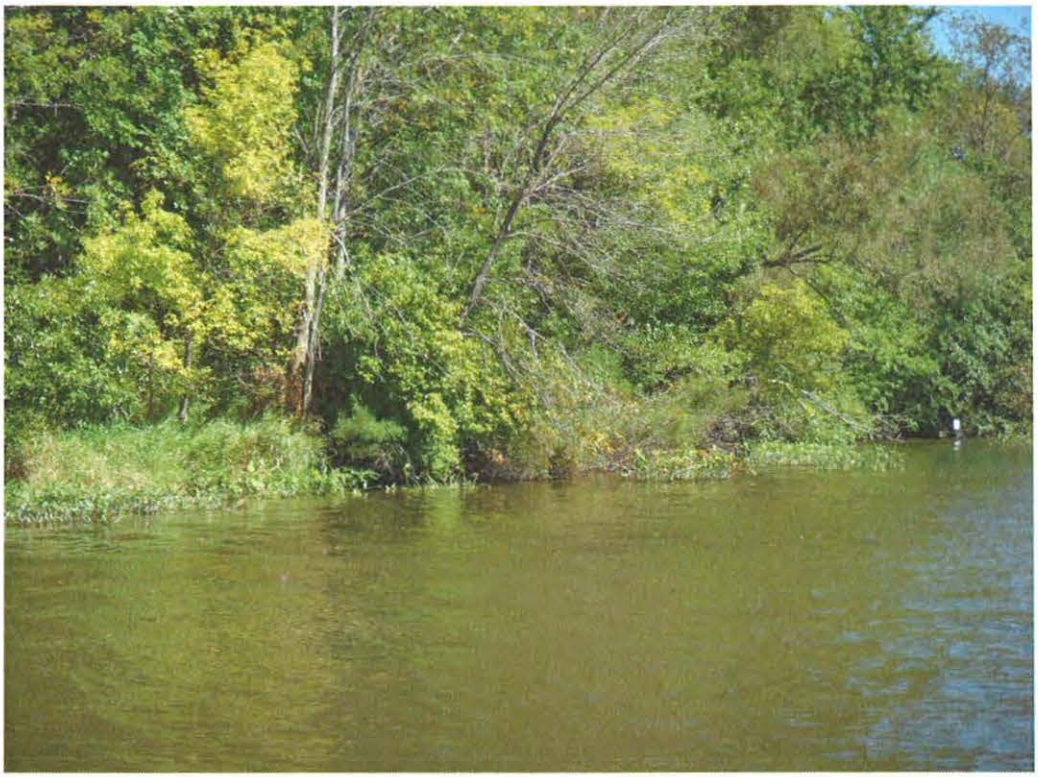


Photo 0191 – Looking northeast at right descending bank.

Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 40.0 – MP 39.75 to 40.0

Enbridge Energy

September 14, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-Step Approval Process approved by the USEPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge Inspectors documented compliance with SCAT recommendations (Step 2). A USEPA / Enbridge inspection team (Step 3) was followed by a SCAT Reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA Division Supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Segment Overview

Initial Assessment

The shoreline of segment 40.00 had no oiling on the left descending bank and no oiling on the right descending bank. The over bank areas contained no areas of oil requiring clean-up and islands were not present. There were no problematic areas that require special attention.

Actions

As a result of the assessment, no operations were conducted as outlined in the Kalamazoo River/Enbridge Spill-Cleanup Recommendations Methods.

Outcome

No clean-up activities were undertaken and no remaining oiling conditions were observed. Segment 40.00 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)
    - Right Descending Bank
      - Operations Cleanup Recommendation Table
      - Figures (Air photo and Sketch Map)

- **Appendix B: Step 2 Clean-Up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank- Reassessment Conclusions Table
    - Right Descending Bank- Reassessment Conclusions Table

- **Appendix D: Step 1,2,3,4,5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step Clean-up Process

- **Appendix E: Photos**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Table 2

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods
Date: August 27, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

• *SCAT Review (Shoreline and Overbank)*
• *Operations / Cleanup*
• *Site Inspection*
• *SCAT Reassessment*
• *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment; result in soil erosion, and significant adverse habitat impact.
Floodplain and mud habitats	• In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (snares/pom-pom, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Manual oil removal (scooping with flat shovels, rags, sorbent pads) in oiled mud is acceptable where persistent oil occurs in moderate to heavy amounts (or when oil has formed semi-solid to solid masses) or where sensitive resources must be protected.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.

Table 2.

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow regrowth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

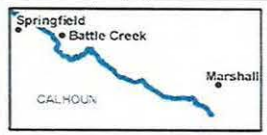
Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release In... ...nt - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 39.75-40.0 Right Bank While Looking Downstream										
SCE4-4	Shoreline	Shoreline Assessment					Reference point only. Boomed area near Morrow Lake overflow point.	No cleanup recommendation.	42.28335	-85.490117
EPA-C-0589	Channel		No oil observed. Does not appear lake water level exceeded the bank height. No followup action needed.					No action needed.	42.28400	-85.49140





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
- No Oil Observed
- Very Light
- Light
- Moderate
- Heavy

Division E: Mile Marker 39.75-40
Right Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

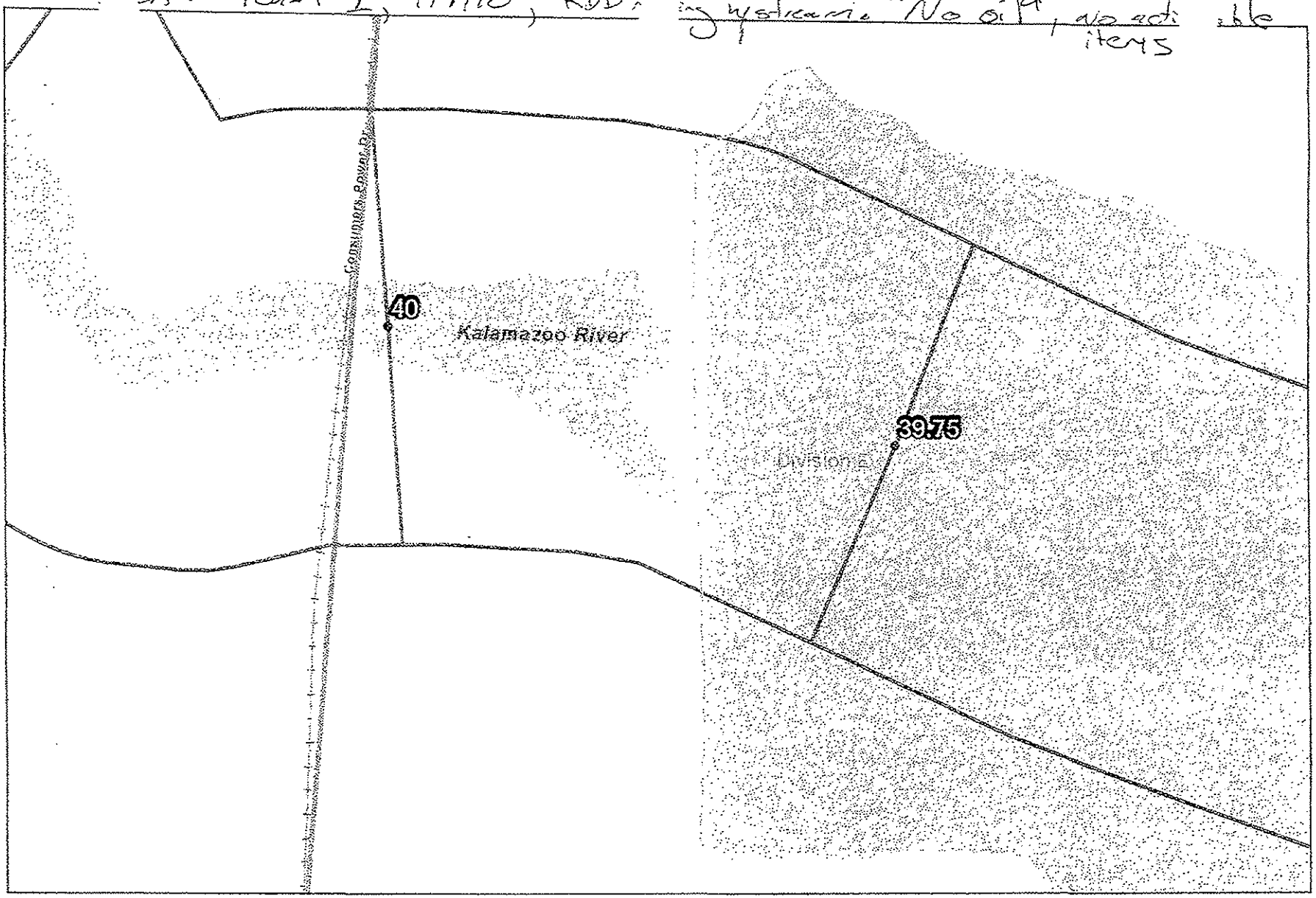
Source: Aerial Photography: USDA, 2009.

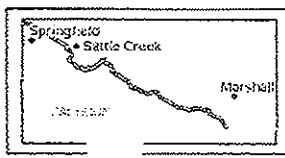
ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet

CAT Team 1, 4/7/10, KDD, ing hystream. *No oil*, no acti able items





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

39.75-40

Enbridge ... e Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

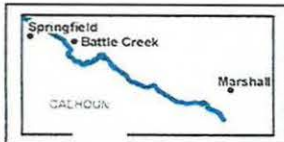
ENTRIX

Enbridge Pipeline Release In... ...it - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division E: Mile Marker 39.75-40.0 Left Bank While Looking Downstream										
							No Operational Focus Areas Identified			





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

Division E: Mile Marker 39.75-40
Left Bank While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

www.entrix.com

Coordinate System: NAD 1983 State Plane [illegible] South Feet





Quarter Mile Segment
Divisions
Shoreline
River_QuarterMiles

Team 3 : 9/01/10
39.75-40

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

0 75 150
Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX
www.entrix.com
Coordinate System: NAD 1983 State Plane Michigan South Feet

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☐ **SCAT Requirements/Clean Up Complete or NA**

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date:_____ Time: AM / PM

Operations Division:_____ Segment ID: From_____ Start MP to End MP_____ Segment Length: 0.25 mile

Bank: LDB / RDB ☐ Island

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: _____

Division Supervisor(Contractor): _____

SCAT Assessment determined that no cleanup operations were necessary.

SCAT Revetted – Description of Clean Up Required

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

No SCAT reassessment of segment conducted; Initial SCAT survey indicated no clean-up operations necessary.

Appendix D
Step 1,2,3,4,5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division: E **Segment ID: From MP** 39.75 **to MP** 40.00 **Segment Length: 0.25 mile**

1. **SCAT** ☒
2. **Clean up** ☒
3. **Inspection**

Signature CHRISTOPHER HAWK	8-31-10 (date)	Enbridge
Signature MJ Nalepinski	31 Aug '10 (date)	EPA

4. **SCAT Reassessment**

Signature Michael Van Loan	09/15/2010 (date)	Enbridge	Pamela E. Rice 9/5/10 Pamela E. RICE
Signature Gary A. Amendola	9.5.10 (date)	EPA	Michelle Kerr 09.05.10 MICHELLE KERR
Signature Christopher Champitt	9/5/10 (date)	MDNRE	

5. **EPA**

Signature GARY LIPSON	9/14/10 (date)	EPA Division Supervisor

Appendix E
Photos



Photo 0110 - Looking northwest at right descending bank.

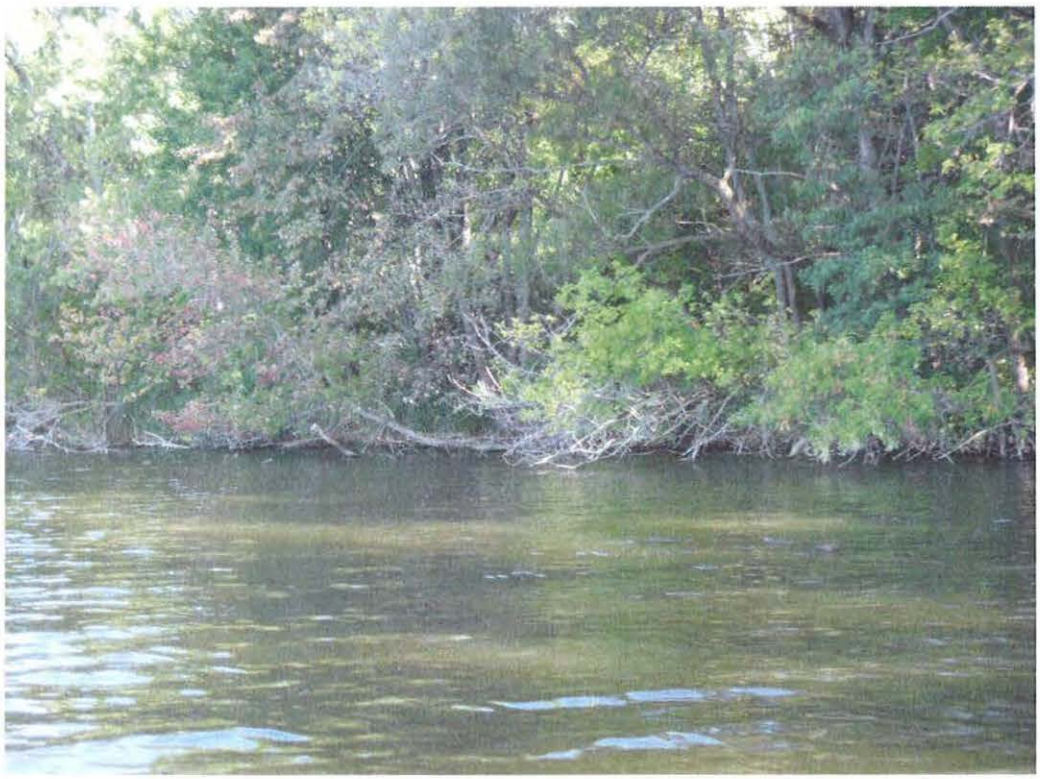


Photo 0111 – Looking northwest at right descending bank.



Photo 0112 – Looking west at right descending bank and dam.

Field Photo Log – Segment MP 40.00

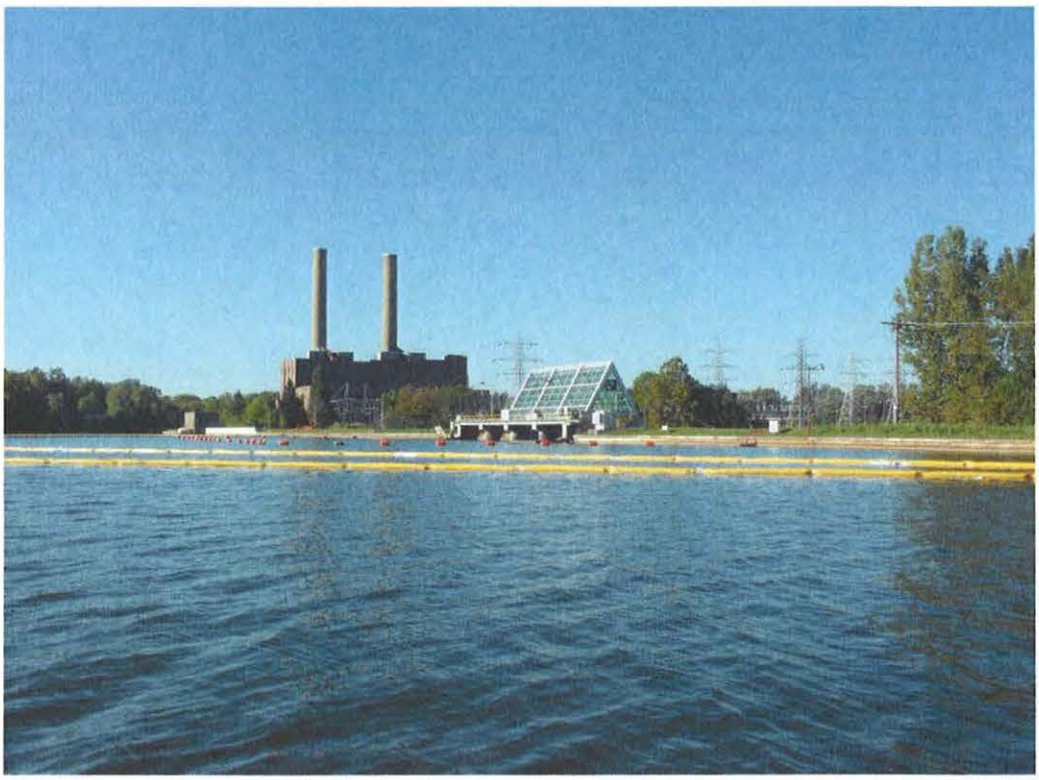


Photo 0113 – Looking southwest at dam .

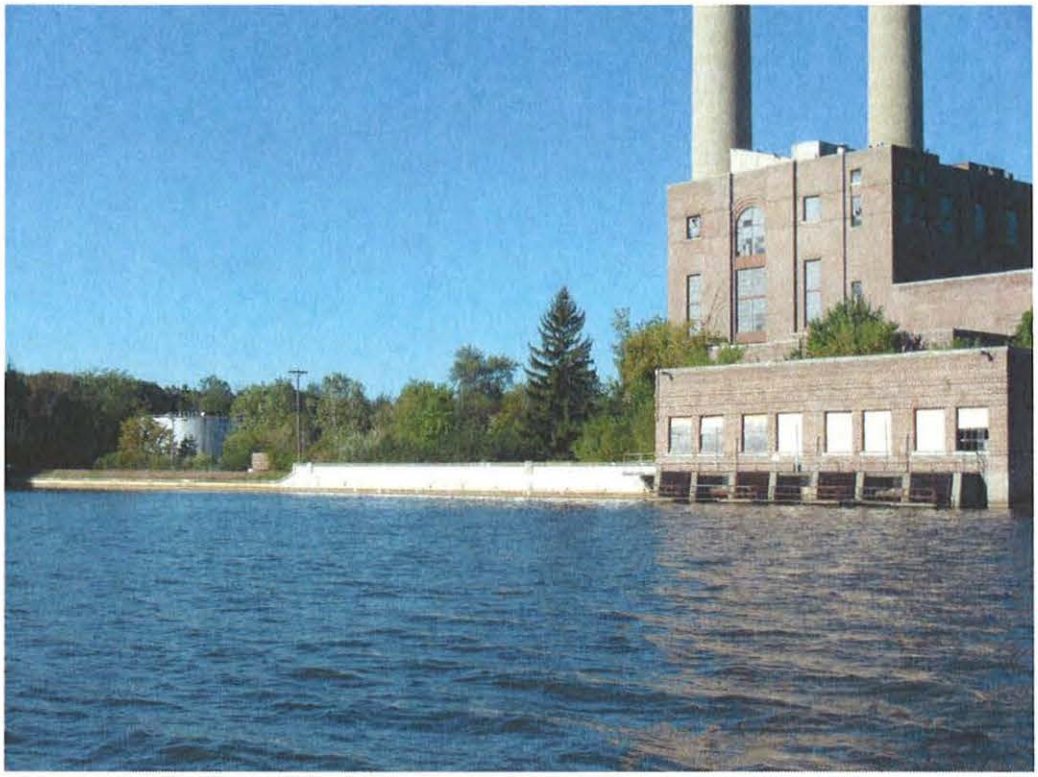


Photo 0114 – Looking southwest at dam.

Appendix II
Enbridge Oil Spill Cleanup Procedure for Riprap Section of Flood Control Project within the Kalamazoo River

ENBRIDGE OIL SPILL CLEANUP PROCEDURE FOR THE RIPRAP SECTION OF THE FLOOD CONTROL PROJECT WITHIN THE KALAMAZOO RIVER

Description. This work includes removing and replacing riprap on the levees of the City of Battle Creek Flood Control Channel.

Materials. Furnish plain riprap in accordance with Section 916 and furnish geotextile liner, where necessary, in accordance with Section 910 of the 2003 Michigan Department of Transportation Standard Specifications for Construction.

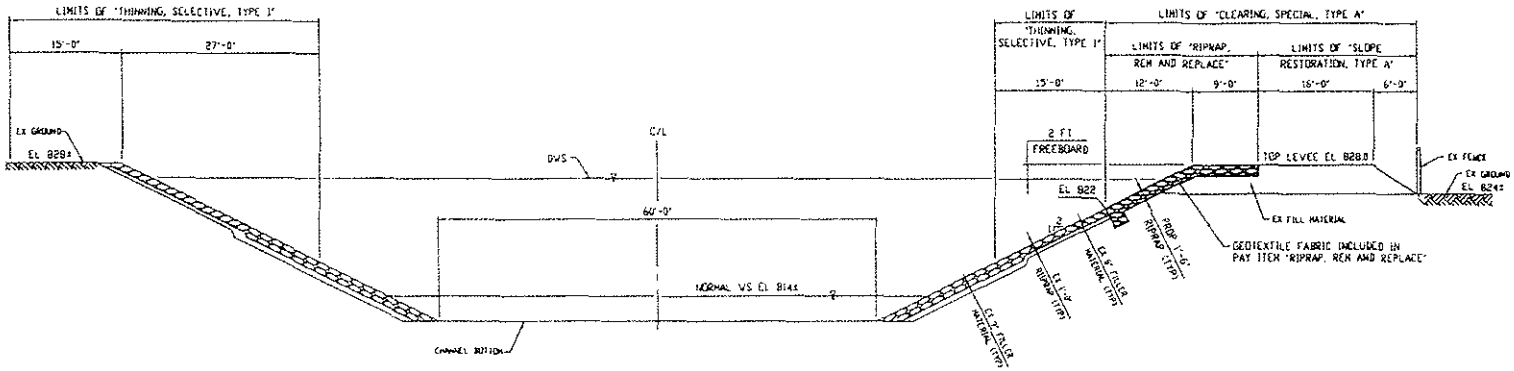
Cleanup. All work shall conform to the Section 813 of the 2003 Michigan Department of Transportation Standard Specifications for Construction, except as modified herein.

All oiled rocks must be removed from the riprap section. Check geotextile fabric for any oil. If oil is present, replace the fabric in accordance to the specifications above.

If areas have only remnants of geotextile fabric, then the levees shall be cleared of vegetation, including root balls, to the limits as shown on the plans. Prior to placing geotextile liner below the riprap, embankment shall be placed so that the reconstructed levee will match the original design elevations.

**Note: The soil beneath the riprap in the area downstream of the Mill Pond Dam is contaminated. Use caution while working. In addition, the soil will need to be removed, stockpiled, tested, and disposed of properly based on test results.*

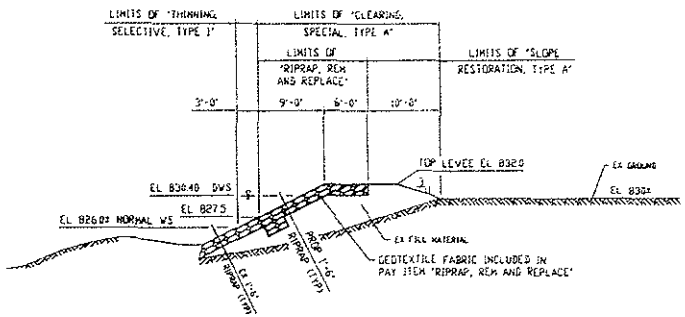
The soil in the riprap section above the dam is not considered contaminated.



TYPICAL RIPRAP SECTION

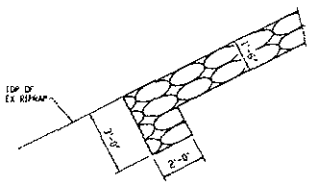
(APPLIES FROM MONROE STREET DAM TO BEGINNING OF CONCRETE LINED CHANNEL)

NOTE
CONTRACTOR SHALL HAVE ADEQUATE AMOUNTS OF SAND AND BAGS AVAILABLE TO RESTORE LEVEE IN THE EVENT THAT FLOOD WATER LEVELS APPROACH DWS DURING RECONSTRUCTION OF LEVEES. INCLUDED IN THE PAY ITEM "MOBILIZATION"



TYPICAL LEVEE SECTION

BETWEEN MONROE ST. DAM & DICKMAN ROAD (OLD DOUGLAS ST.)
(LEFT AND RIGHT BANKS)



RIPRAP TOE DETAIL

MISCELLANEOUS QUANTITIES - LEVEE		
ITEM	UNIT	AMOUNT
Clearing, Special, Type A	Acre	0.98
Erosion Control, Silt Fence	Ft	2000
Riprap, Rem and Replace	Syd	3139
Slope Restoration, Type A	Syd	1622
Weed Control	Acre	2
Thinning, Selective, Type 1	Acre	1.66
Embankment, CIP	Cyd	100

NOTES:

THE WORK COVERED BY THESE PLANS INCLUDES CLEARING, RECONSTRUCTION OF LEVEES AND RIPRAP, REPAIR OF CONCRETE CHANNEL, REPAIR AND INSPECTION OF SUBDRAINS AND REPLACEMENT OF FENCING.

THE CONTRACTOR SHALL LOCATE ALL ACTIVE UTILITIES PRIOR TO STARTING WORK AND SHALL CONDUCT HIS OPERATIONS IN SUCH A MANNER AS TO ENSURE THAT THOSE UTILITIES NOT REQUIRING RELOCATION WILL NOT BE DISTURBED.

REFER TO SPECIAL PROVISIONS FOR CLEARING AND RIPRAP.

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DEQ-LWMD
File # 13-40-P
APPROVED PLANS
Page 2 of 10
by 12/21/09

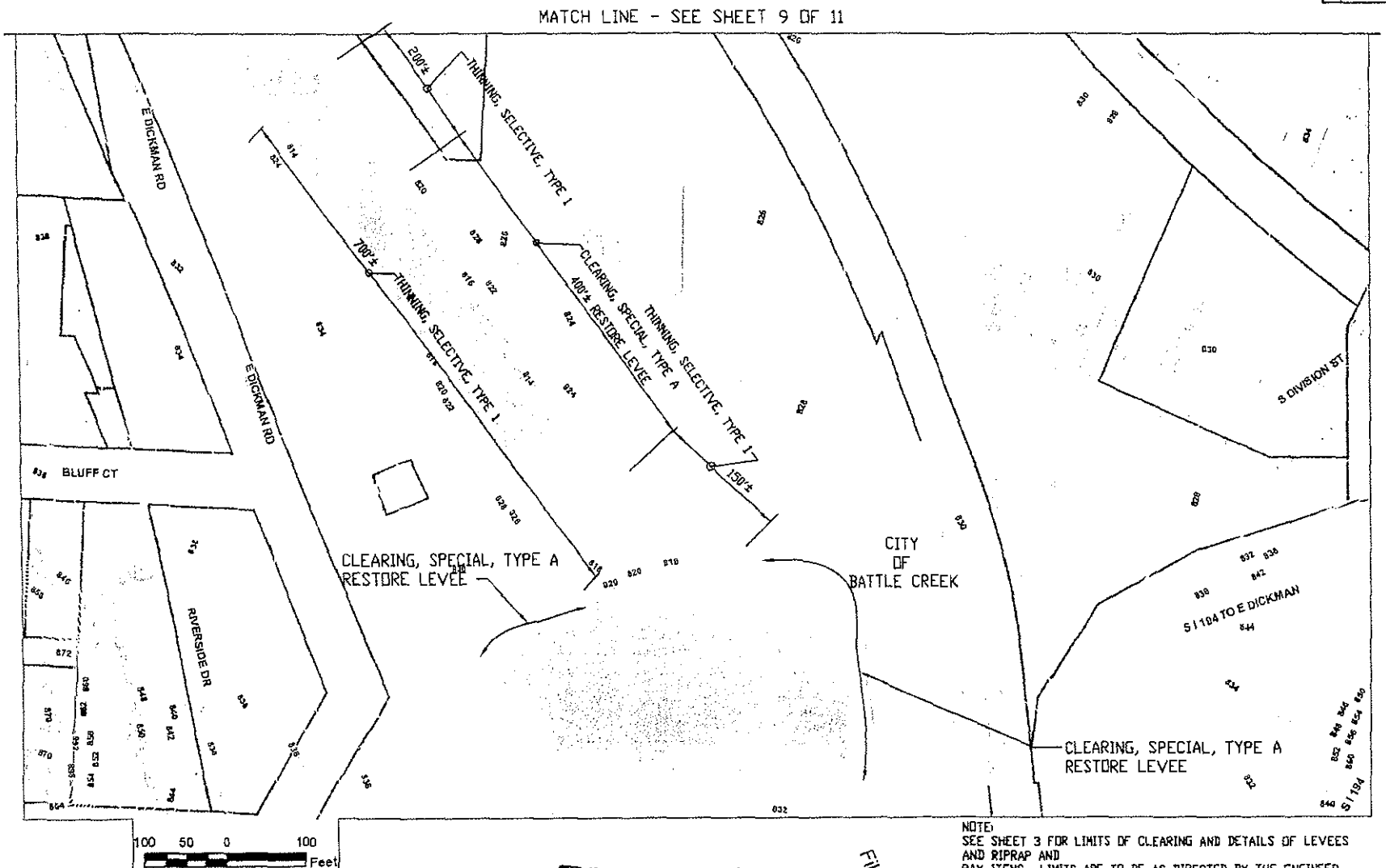
WORK THIS SHEET WITH SHEET 10

HH ENGINEERING LTD.

RIPRAP & LEVEE CHANNEL SECTIONS
KALAMAZOO RIVER FLOOD CONTROL REPAIRS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
04/07/09			BATTLE CREEK	3 OF 33

CORRECTED AS PER U.S. SAP, JR
DATE: 04/07/09
DATE
CHECKED BY
DATE
CHECKED BY
FILE NAME: 828455dwg



NOTE:
SEE SHEET 3 FOR LIMITS OF CLEARING AND DETAILS OF LEVEES AND RIPRAP AND PAY ITEMS. LIMITS ARE TO BE AS DIRECTED BY THE ENGINEER.

HH ENGINEERING LTD.

GENERAL PLAN
KALAMAZOO RIVER CUT-OFF CHANNEL

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
04/07/09			BATTLE CREEK	10 OF 11

RECEIVED
MAY 21 2009
LWMD-KALAMAZOO

DEQ-LWMD
File # 09-13-10-P
APPROVED PLANS
Page 9 of 10
6/29/09

Appendix III
Shoreline Oil Terminology / Codes for Oil Spills of Black Oil

Figure 5.
Shoreline oil terminology/codes for spills of black oil.

Oil Distribution

C	Continuous	91 - 100%
B	Broken	51 - 90%
P	Patchy	11 - 50%
S	Sporadic	1 - 10%
T	Trace	<1%

Surface Oiling Descriptors - Width

Very Narrow	< ____ m
Narrow	>____ - <____ m
Medium	>____ - <____ m
Wide	< ____ m

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Appendix IV
Kalamazoo River / Enbridge Pipeline Release – Cleanup Recommendation Methods

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

5-STEP APPROVAL PROCESS

- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects

Appendix V
Photographic Documentation of Cleanup Methods

Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC01944

Photograph Date: 08-26-2010

Segment No: C 4.75

Habitat Type: Aquatic Vegetation

Description: Aerial photo of Manual aquatic vegetation removal



Photograph No: DSC02079

Photograph Date: 08-26-2010

Segment No: C 6.0

Habitat Type: Aquatic Vegetation

Description: Boomed area



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC02192

Photograph Date: 08-26-2010

Segment No: C 5.75

Habitat Type: Aquatic Vegetation

Description: Low-pressure flushing



Photograph No: DSC02202

Photograph Date: 08-26-2010

Segment No: C 5.75

Habitat Type: Aquatic Vegetation

Description: Low-pressure flushing



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC02206

Photograph Date: 08-26-2010

Segment No: C 5.75

Habitat Type: Aquatic Vegetation

Description: Boomed area



Photograph No: DSC03604

Photograph Date: 08-14-2010

Segment No: C 5.5

Habitat Type: Aquatic Vegetation

Description: Manual aquatic vegetation removal



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC03684

Photograph Date: 08-28-2010

Segment No: C 15.5

Habitat Type: Aquatic Vegetation

Description: Manual aquatic vegetation removal



Photograph No: DSC04061

Photograph Date: 08-28-2010

Segment No: C 4.75

Habitat Type: Aquatic Vegetation

Description: Manual aquatic vegetation removal equipment



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

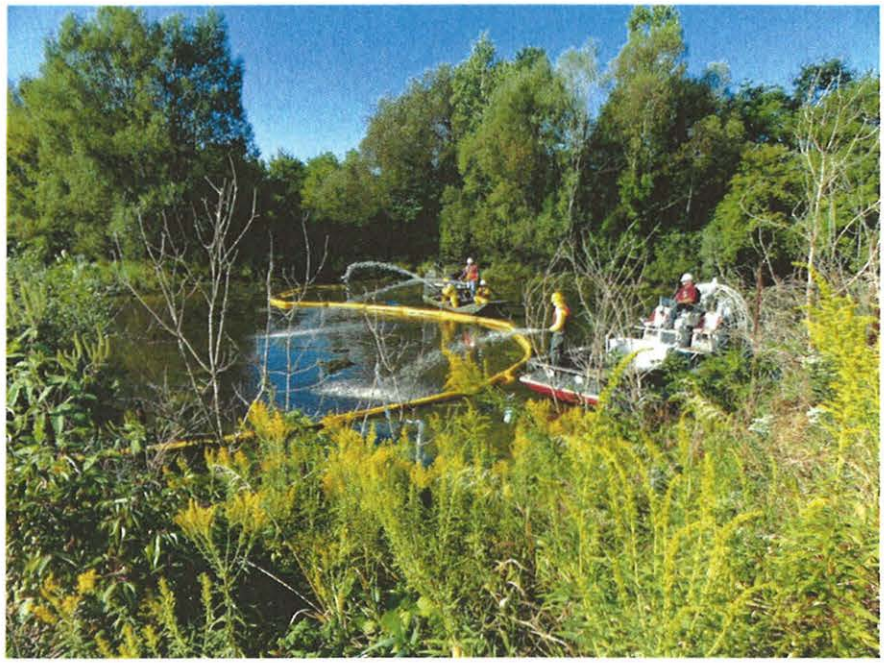
Photograph No: DSC02182

Photograph Date: 08-26-2010

Segment No: C 5.75

Habitat Type: Emergent Wetlands (non-wooded)

Description: Low-pressure flushing



Photograph No: DSC02276

Photograph Date: 08-26-2010

Segment No: C 2.5

Habitat Type: Emergent Wetlands (non-wooded)

Description: Sorbent pads



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC02278

Photograph Date: 08-26-2010

Segment No: C 2.5

Habitat Type: Emergent Wetlands (non-wooded)

Description: Sorbent pads and boom



Photograph No: DSC02280

Photograph Date: 08-26-2010

Segment No: C 2.5

Habitat Type: Emergent Wetlands (non-wooded)

Description: Sorbent pads



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC02298

Photograph Date: 08-26-2010

Segment No: C 2.5

Habitat Type: Emergent Wetlands (non-wooded)

Description: Manual oiled vegetation removal



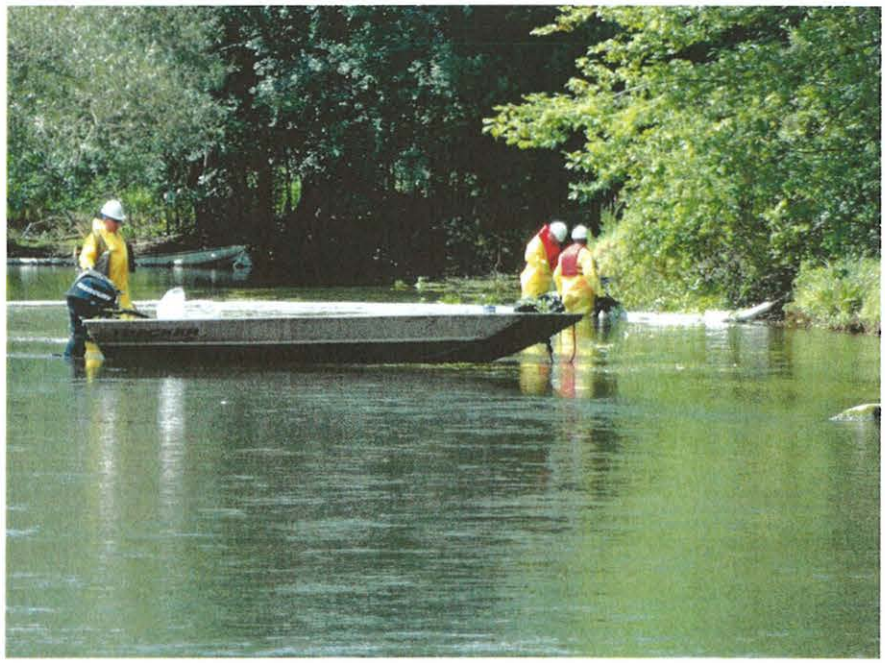
Photograph No: DSC02312

Photograph Date: 08-26-2010

Segment No: C 2.5

Habitat Type: Emergent Wetlands (non-wooded)

Description: Vegetation inspection



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC02314

Photograph Date: 08-26-2010

Segment No: C 2.5

Habitat Type: Emergent Wetlands (non-wooded)

Description: Sorbent pads



Photograph No: DSC04755

Photograph Date: 08-29-2010

Segment No: C 10.75

Habitat Type: Emergent Wetlands (non-wooded)

Description: Oiled vegetation removal



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC01792

Photograph Date: 08-25-2010

Segment No: C 11.5

Habitat Type: Flood Plain and Mud Habitat

Description: Pom-poms application



Photograph No: DSC01828

Photograph Date: 08-25-2010

Segment No: C 11.5

Habitat Type: Flood Plain and Mud Habitat

Description: Removal of vegetation through manual raking



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC01855

Photograph Date: 08-25-2010

Segment No: C 11.5

Habitat Type: Flood Plain and Mud Habitat

Description: Pom-poms



Photograph No: DSC05440

Photograph Date: 08-29-2010

Segment No: C 2.25

Habitat Type: Flood Plain and Mud Habitat

Description: Cut, bag and removal of oiled vegetation



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC04094

Photograph Date: 08-28-2010

Segment No: C 6.0

Habitat Type: Flood Plain and Mud Habitat

Description: Manual soil removal along shoreline.



Photograph No: DSC04636

Photograph Date: 08-29-2010

Segment No: C 11.5

Habitat Type: Flood Plain and Mud Habitat

Description: Manual soil removal and pom pom application



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC02582

Photograph Date: 08-26-2010

Segment No: C 9.5

Habitat Type: Islands

Description: Containment boom around island



Photograph No: DSC03443

Photograph Date: 08-27-2010

Segment No: C 2.5

Habitat Type: Islands

Description: Containment and absorbent boom around island



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC03953

Photograph Date: 08-31-2010

Segment No: C 3.75

Habitat Type: Islands

Description: Aerial photo: Containment and absorbent boom around island



Photograph No: DSC03956

Photograph Date: 08-31-2010

Segment No: C 4.0

Habitat Type: Islands

Description: Aerial photo: Containment and absorbent boom around island



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC05842

Photograph Date: 08-30-2010

Segment No: C 9.5

Habitat Type: Islands

Description: Woody vegetation removal



Photograph No: DSC05848

Photograph Date: 08-30-2010

Segment No: C 9.5

Habitat Type: Islands

Description: Containment boom around island



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00170

Photograph Date: 08-23-2010

Segment No: C 9.25

Habitat Type: Large Woody Debris

Description: Large woody debris removal



Photograph No: DSC00172

Photograph Date: 08-23-2010

Segment No: C 9.25

Habitat Type: Large Woody Debris

Description: Large woody debris storage area



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00176

Photograph Date: 08-23-2010

Segment No: C 9.25

Habitat Type: Large Woody Debris

Description: Woody debris shoreline removal



Photograph No: DSC00177

Photograph Date: 08-23-2010

Segment No: C 9.25

Habitat Type: Large Woody Debris

Description: Woody debris shoreline removal



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC09877

Photograph Date: 08-22-2010

Segment No: C 15.25

Habitat Type: Large Woody Debris

Description: Large woody debris



Photograph No: DSC00195

Photograph Date: 08-23-2010

Segment No: C 9.0

Habitat Type: Large Woody Debris

Description: Woody debris shoreline removal



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

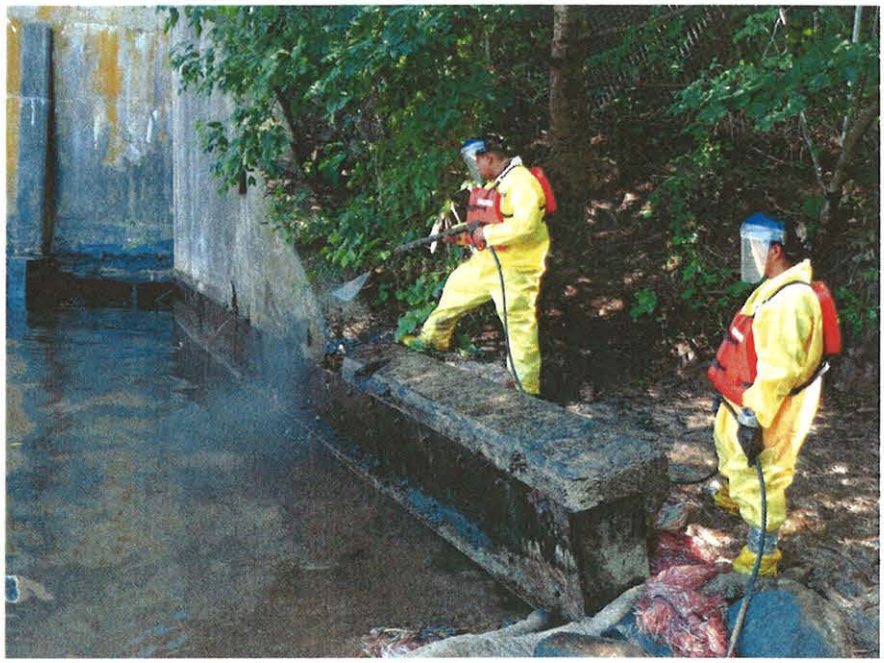
Photograph No: DSC03572

Photograph Date: 08-27-2010

Segment No: C 6.0

Habitat Type: Manmade Structures and Large Rocks

Description: Pressure washing of bridge abutment



Photograph No: DSC03517

Photograph Date: 08-14-2010

Segment No: C 12.75

Habitat Type: Oiled Debris

Description: Oiled debris cleanup



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC05393

Photograph Date: 08-29-2010

Segment No: C 6.0

Habitat Type: Manmade Structures and Large Rocks

Description: Pressure washing of bridge



Photograph No: DSC06513

Photograph Date: 08-30-2010

Segment No: C 6.0

Habitat Type: Manmade Structures and Large Rocks

Description: Pressure washing of rock



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC04084

Photograph Date: 08-28-2010

Segment No: C 6.0

Habitat Type: Oiled Mixed Sand and Gravel

Description: Mixed gravel and rock cleanup



Photograph No: DSC06603

Photograph Date: 08-30-2010

Segment No: C 6.0

Habitat Type: Oiled Mixed Sand and Gravel

Description: Mixed gravel and rock cleanup



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC03151

Photograph Date: 08-29-2010

Segment No: C 4.25

Habitat Type: Oiled Debris

Description: Aerial view of debris on island



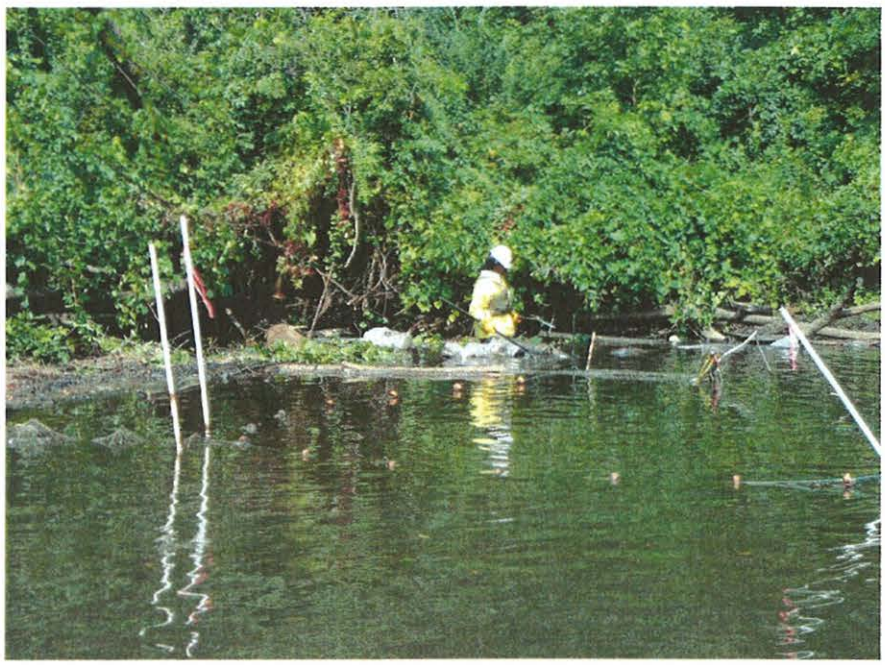
Photograph No: DSC05251

Photograph Date: 08-29-2010

Segment No: C 14.25

Habitat Type: Oiled Debris

Description: Cleanup of shoreline oiled debris



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC09653

Photograph Date: 08-21-2010

Segment No: C 14.75

Habitat Type: Shoreline

Description: Shoreline cleanup



Photograph No: DSC03019

Photograph Date: 08-27-2010

Segment No: C 9.25

Habitat Type: Shoreline

Description: Vegetation clearing



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00571

Photograph Date: 08-4-2010

Segment No: C 2.25

Habitat Type: Turf

Description: Turf removal



Photograph No: DSC04400

Photograph Date: 08-22-2010

Segment No: C 9.5

Habitat Type: Turf

Description: Low pressure flushing



Photographic Documentation of Cleanup Methods

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC06546

Photograph Date: 08-21-2010

Segment No: C 6.0

Habitat Type: Turf

Description: Low pressure flushing



Appendix VI
Photographic Before and After Documentation of Differing Habitats Along the Kalamazoo River

Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

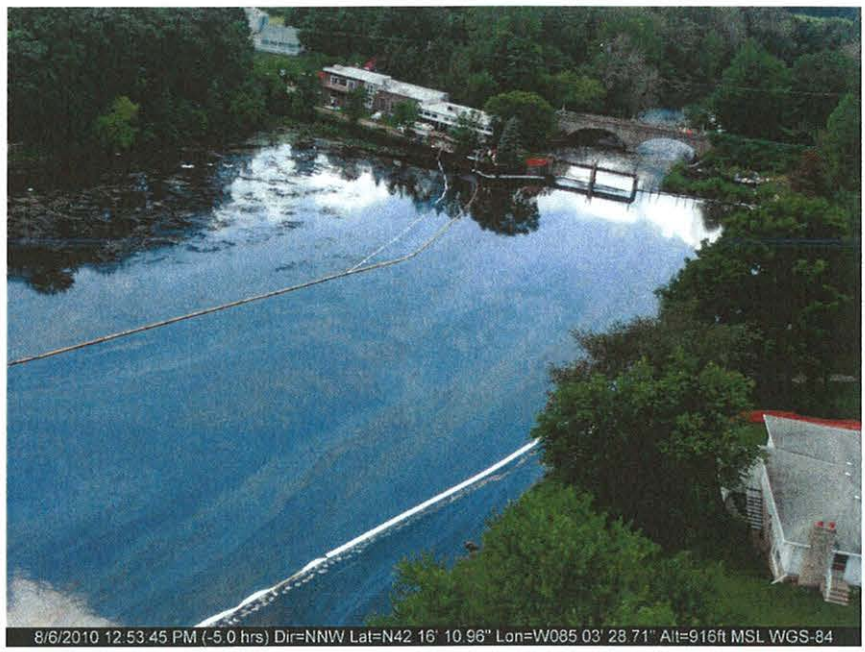
Photograph No: DSC01078

Photograph Date: 08-06-2010

Segment No: C 5.75

Habitat Type: Aquatic Vegetation

Description: Aerial photo - before



Photograph No:DSC07868

Photograph Date: 09-17-2010

Segment No: C 5.75

Habitat Type: Aquatic Vegetation

Description: Aerial photo – after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

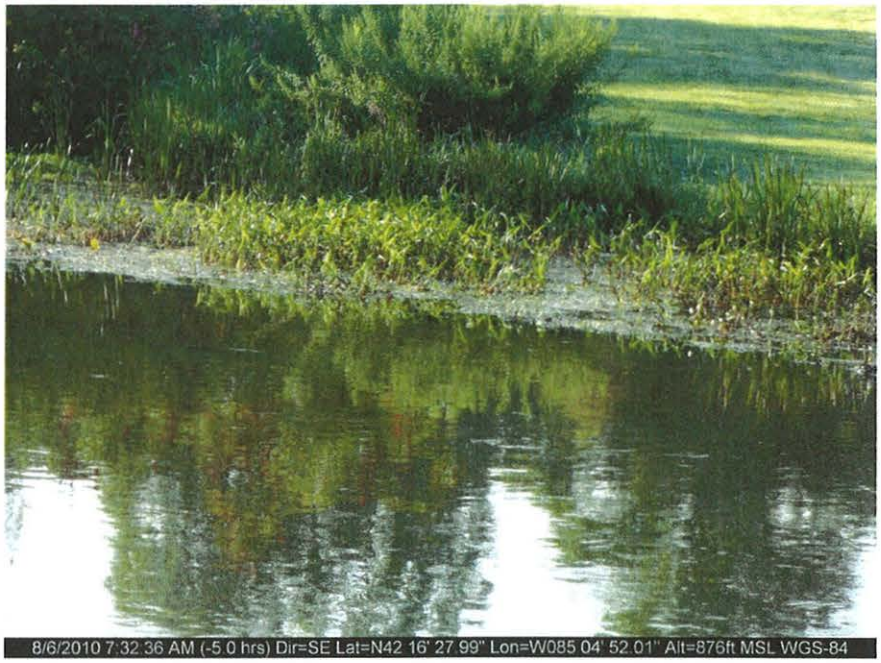
Photograph No: DSC01530

Photograph Date: 08-06-2010

Segment No: C 7.25

Habitat Type: Aquatic Vegetation

Description: Shoreline vegetation - before



Photograph No: DSC04613

Photograph Date: 09-18-2010

Segment No: C 7.25

Habitat Type: Aquatic Vegetation

Description: Shoreline vegetation - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

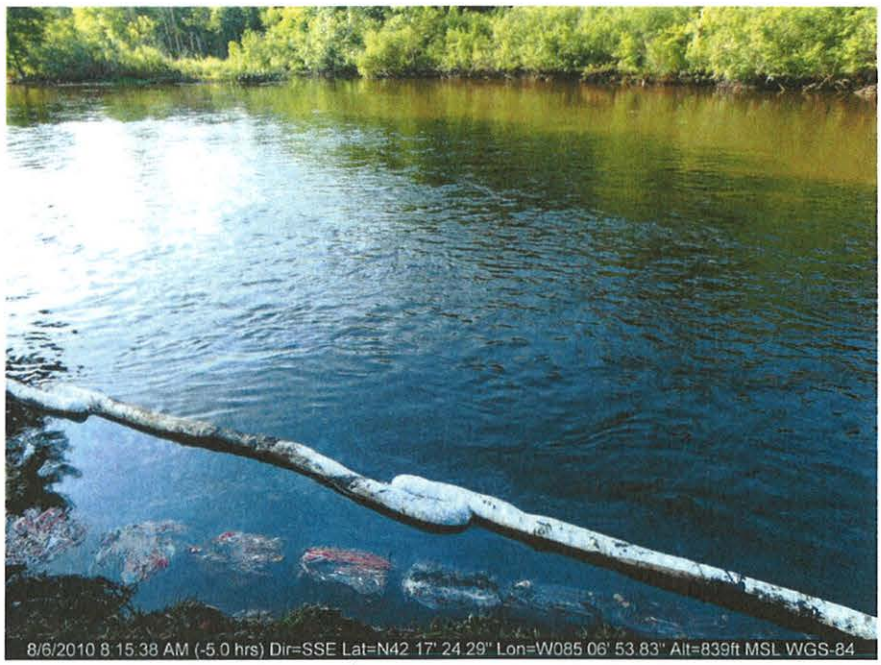
Photograph No:

Photograph Date: 08-06-2010

Segment No: C 9.50

Habitat Type: Aquatic Vegetation

Description: Boomed shoreline - before



Photograph No: DSC04605

Photograph Date: 09-18-2010

Segment No: C 9.50

Habitat Type: Aquatic Vegetation

Description: Boomed shoreline - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

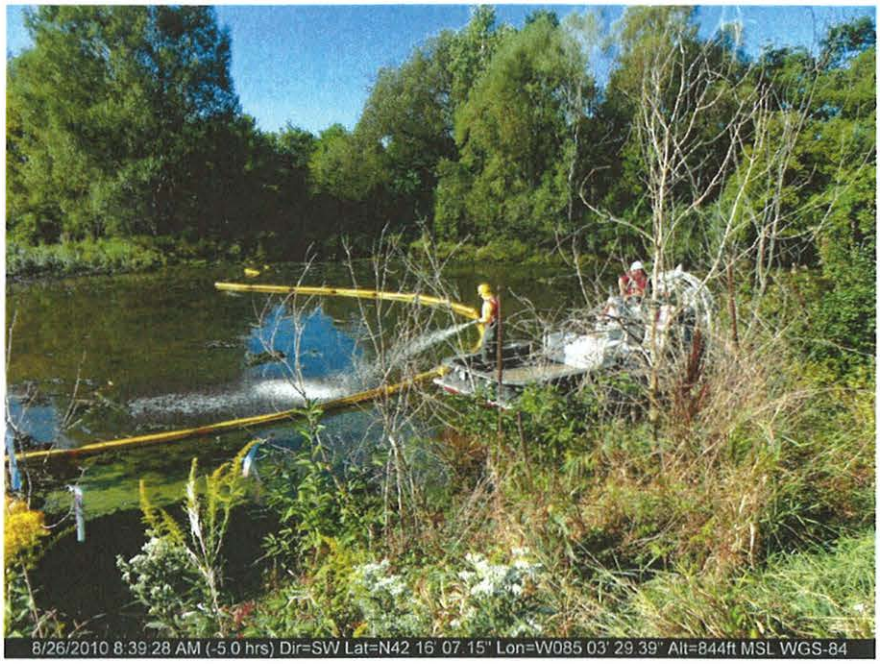
Photograph No: DSC02179

Photograph Date: 08-26-2010

Segment No: C 5.75

Habitat Type: Aquatic Vegetation

Description: Boomed cove - before



Photograph No: DSC04621

Photograph Date: 09-18-2010

Segment No: C 5.75

Habitat Type: Aquatic Vegetation

Description: Boomed cove – after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC01604

Photograph Date: 08-06-2010

Segment No: C 15.25

Habitat Type: Emergent Wetlands (non-wooded)

Description: Cove area – before



Photograph No: DSC04599

Photograph Date: 09-18-2010

Segment No: C 15.25

Habitat Type: Emergent wetlands (non-wooded)

Description: Cove area – after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00076

Photograph Date: 08-03-2010

Segment No: C 6.00

Habitat Type: Floodplain and Mud Habitats

Description: S Ceresco Dam - before



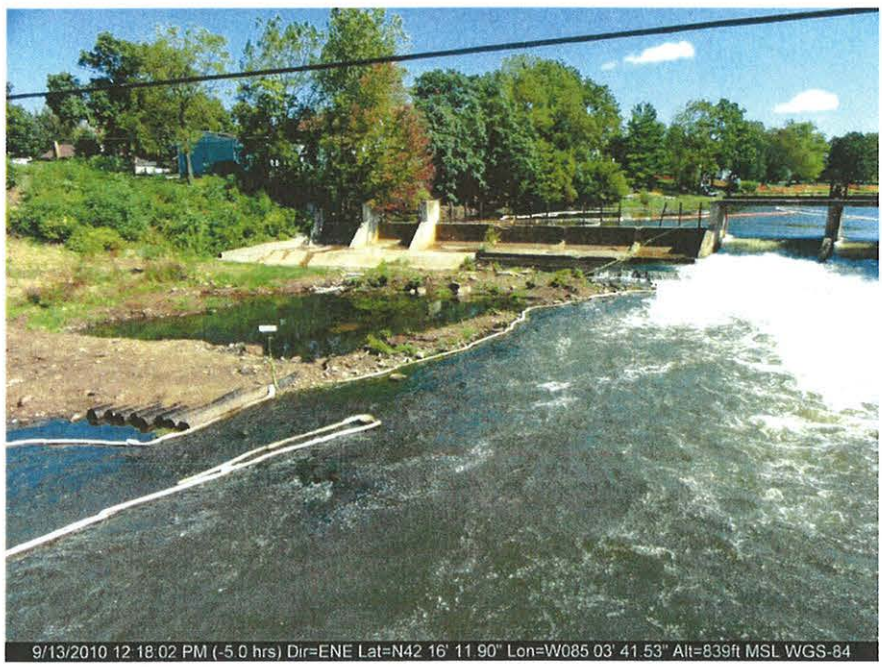
Photograph No: DSC03549

Photograph Date: 09-13-2010

Segment No: C 6.00

Habitat Type: Floodplain and Mud Habitats

Description: S Ceresco Dam - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00390

Photograph Date: 08-05-2010

Segment No: C 12.50

Habitat Type: Floodplain and Mud Habitats

Description: Floodplain - before



Photograph No: DSC02002

Photograph Date: 09-17-2010

Segment No: C 12.50

Habitat Type: Floodplain and Mud Habitats

Description: Floodplain - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC01721

Photograph Date: 08-17-2010

Segment No: C 4.25

Habitat Type: Islands

Description: Island - before



Photograph No: DSC03302

Photograph Date: 09-18-2010

Segment No: C 4.25

Habitat Type: Islands

Description: Island - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC01825

Photograph Date: 08-07-2010

Segment No: C 16.75

Habitat Type: Islands

Description: Islet - before



Photograph No:

Photograph Date: 09-18-2010

Segment No: C 16.75

Habitat Type: Islands

Description: Islet - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00831

Photograph Date: 08-04-2010

Segment No: C 6.00

Habitat Type: Large Woody Debris

Description: Woody debris removal - before



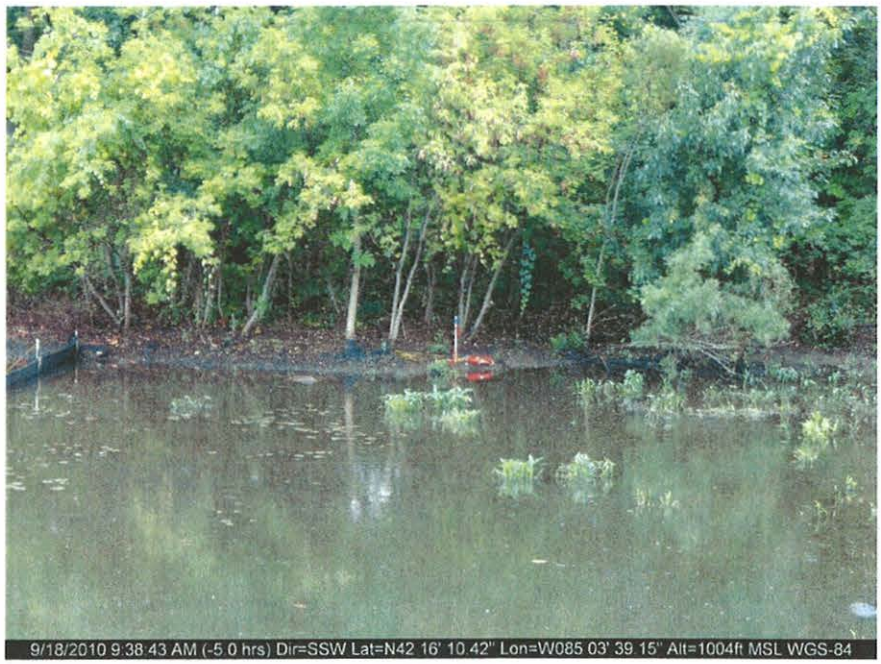
Photograph No: DSC04615

Photograph Date: 09-18-2010

Segment No: C 6.00

Habitat Type: Large Woody Debris

Description: Woody debris removal - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC01852

Photograph Date: 08-07-2010

Segment No: C 17.00

Habitat Type: Large Woody Debris

Description: Woody shoreline - before



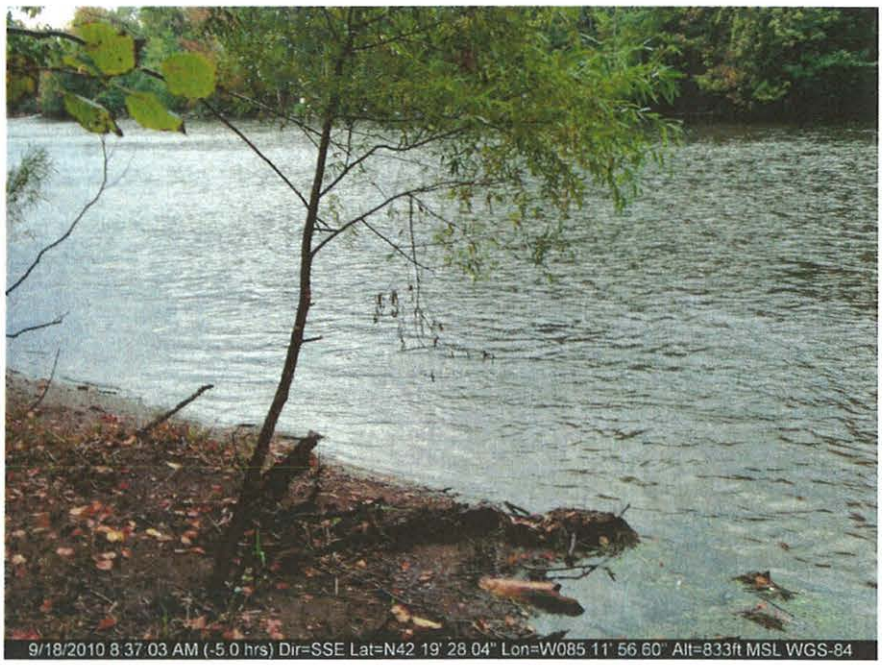
Photograph No: DSC4594

Photograph Date: 09-18-2010

Segment No: C 17.00

Habitat Type: Large Woody Debris

Description: Woody shoreline - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

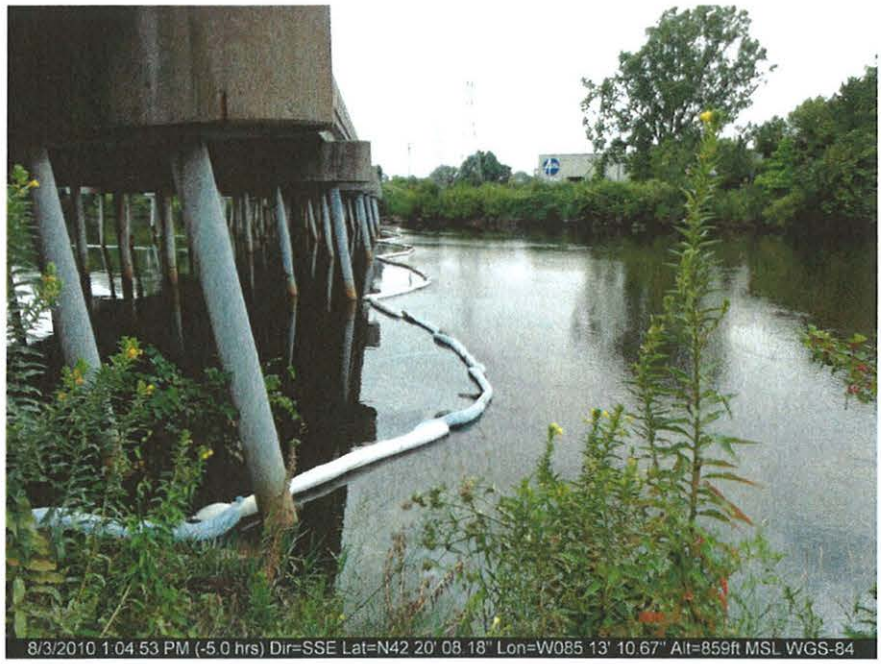
Photograph No: DSC00100

Photograph Date: 08-03-2010

Segment No: D 18.50

Habitat Type: Oiled Debris

Description:N.20th St. Bridge – before



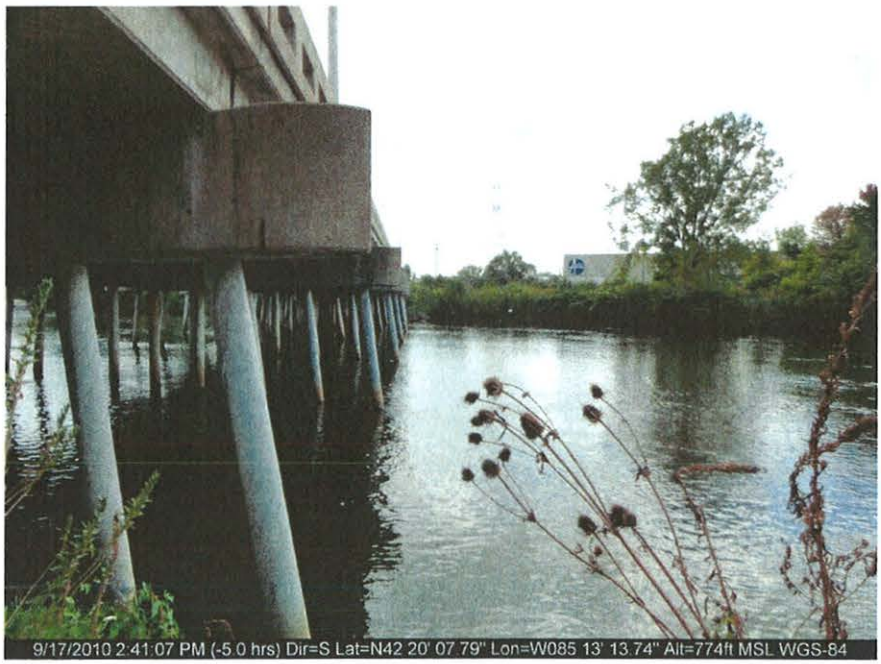
Photograph No: DSC02001

Photograph Date: 09-17-2010

Segment No: D 18.50

Habitat Type: Oiled Debris

Description:N.20th St. Bridge - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00273

Photograph Date: 08-03-2010

Segment No: D 21.50

Habitat Type: Oiled Debris

Description: Woody debris - before



Photograph No: DSC01988

Photograph Date: 09-17-2010

Segment No: D 21.50

Habitat Type: Oiled Debris

Description: Woody debris - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

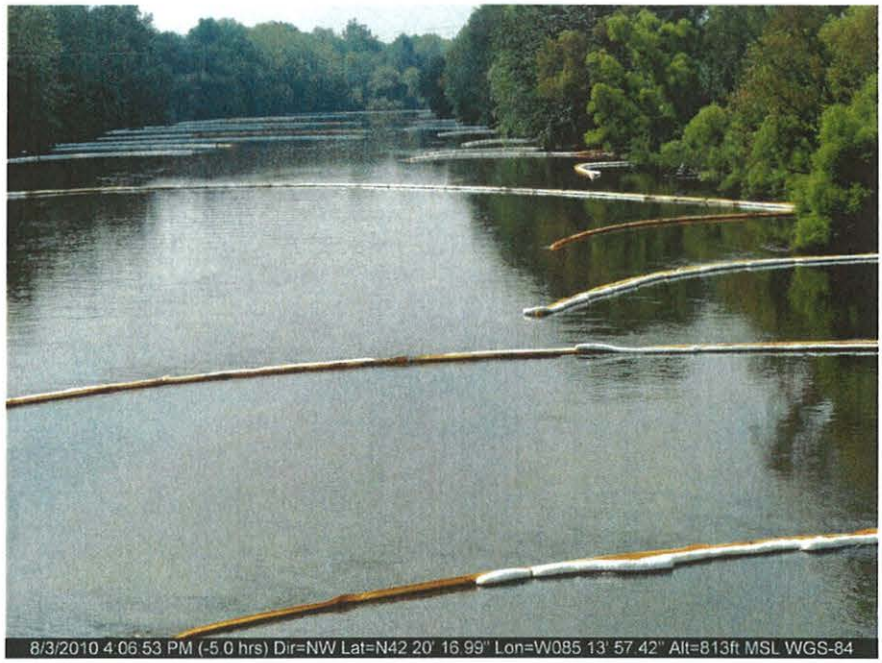
Photograph No: DSC00338

Photograph Date: 08-03-2010

Segment No: D 19.00

Habitat Type: Oiled Debris

Description: Oil booms - before



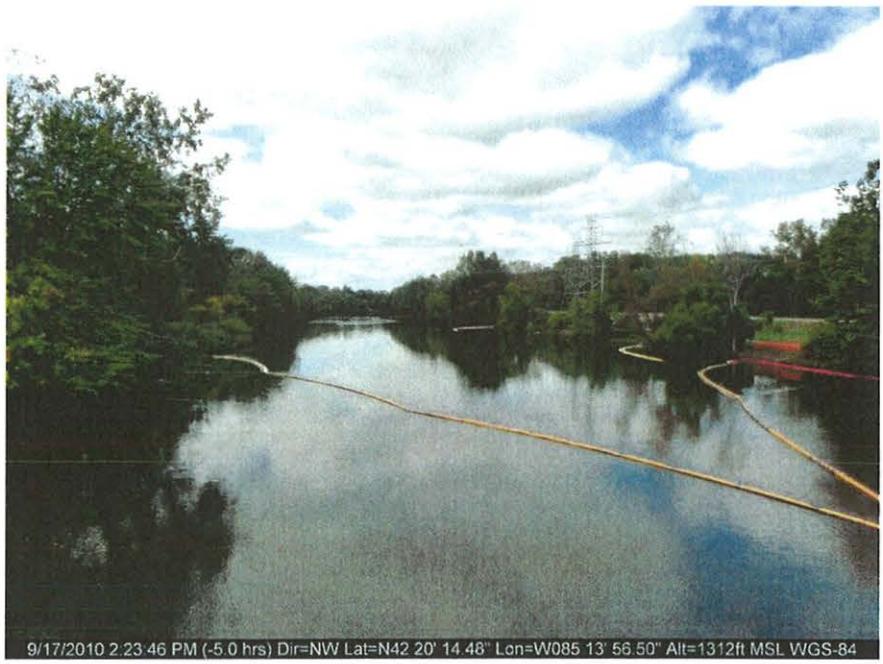
Photograph No: DSC01995

Photograph Date: 09-17-2010

Segment No: D 19.00

Habitat Type: Oiled Debris

Description: Oil booms -after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00410

Photograph Date: 08-04-2010

Segment No: C 5.50

Habitat Type: Oiled Debris

Description: Oiled debris removal - before



Photograph No: DSC01949

Photograph Date: 09-17-2010

Segment No: C 5.50

Habitat Type: Oiled Debris

Description: Oiled debris removal - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00434

Photograph Date: 08-04-2010

Segment No: C 9.50

Habitat Type: Oiled Debris

Description: Oiled shoreline - before



Photograph No: DSC01963

Photograph Date: 09-17-2010

Segment No: C 9.50

Habitat Type: Oiled Debris

Description: Oiled shoreline - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00113

Photograph Date: 08-03-2010

Segment No: D 17.75

Habitat Type: Oiled Manmade Structures and Larger Rocks

Description: Pilings - before



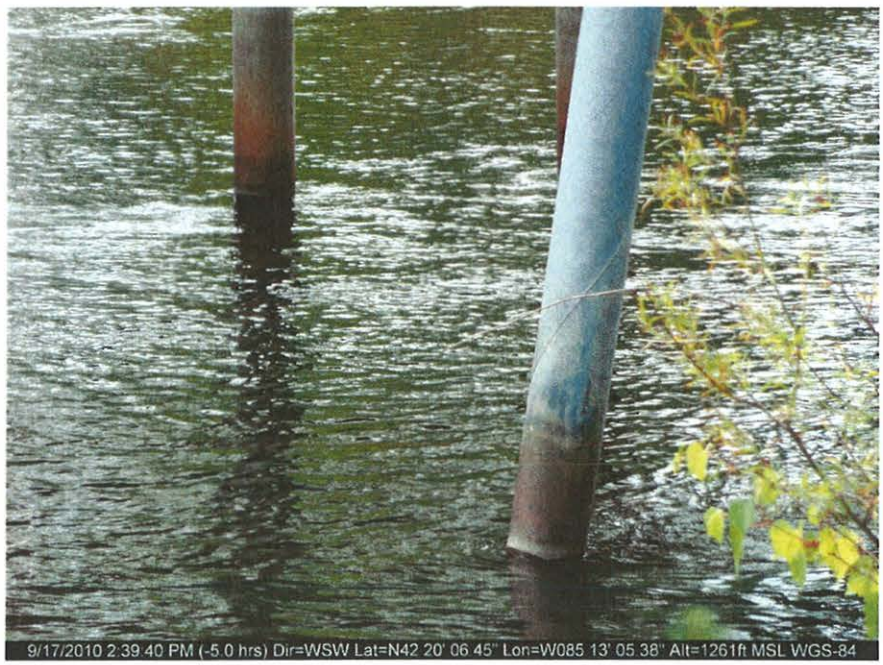
Photograph No: DSC01999

Photograph Date: 09-17-2010

Segment No: D 17.75

Habitat Type: Oiled Manmade Structures and Larger Rocks

Description: Pilings - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No:DSC00223

Photograph Date: 08-03-2010

Segment No: D 21.50

Habitat Type: Oiled Manmade Structures and Larger Rocks

Description: Cobble shoreline - before



Photograph No: DSC01970

Photograph Date: 09-17-2010

Segment No: D 21.50

Habitat Type: Oiled Manmade Structures and Larger Rocks

Description: Cobble shoreline - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

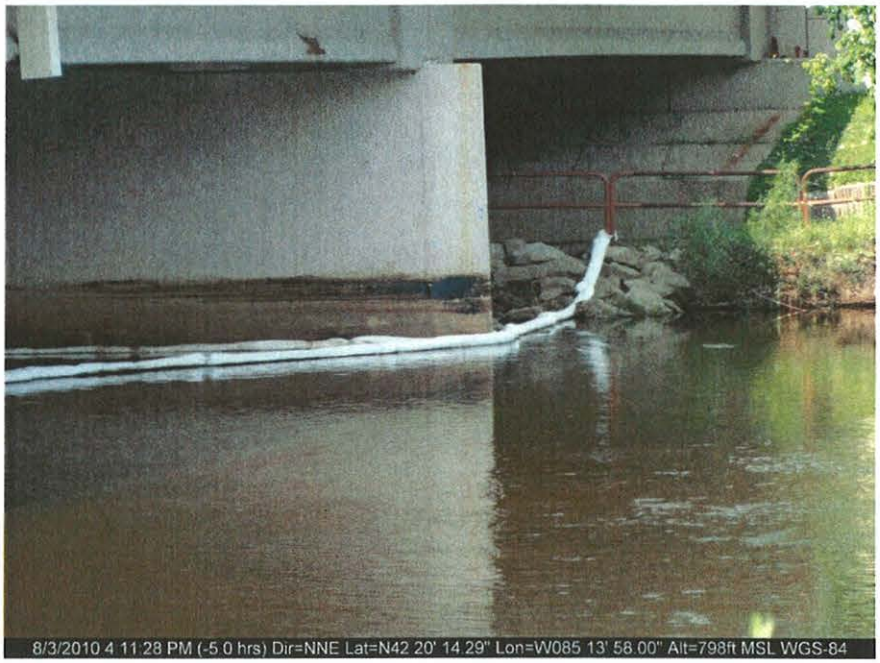
Photograph No: DSC00350

Photograph Date: 08-03-2010

Segment No: D 19.00

Habitat Type: Oiled Manmade Structures and Larger Rocks

Description: Underside of Route 37 bridge - before



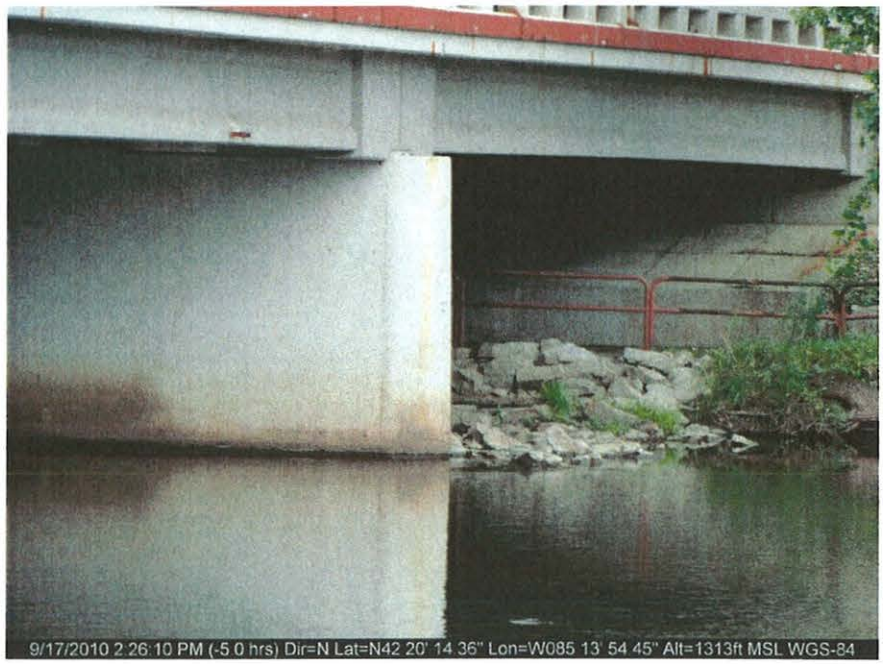
Photograph No: DSC01998

Photograph Date: 09-17-2010

Segment No: D 19.00

Habitat Type: Oiled Manmade Structures and Larger Rocks

Description: Underside of Route 37 bridge - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00404

Photograph Date: 08-04-2010

Segment No: C 6.00

Habitat Type: Oiled Mixed Sand and Gravel

Description: Small cobble shoreline with tree - before



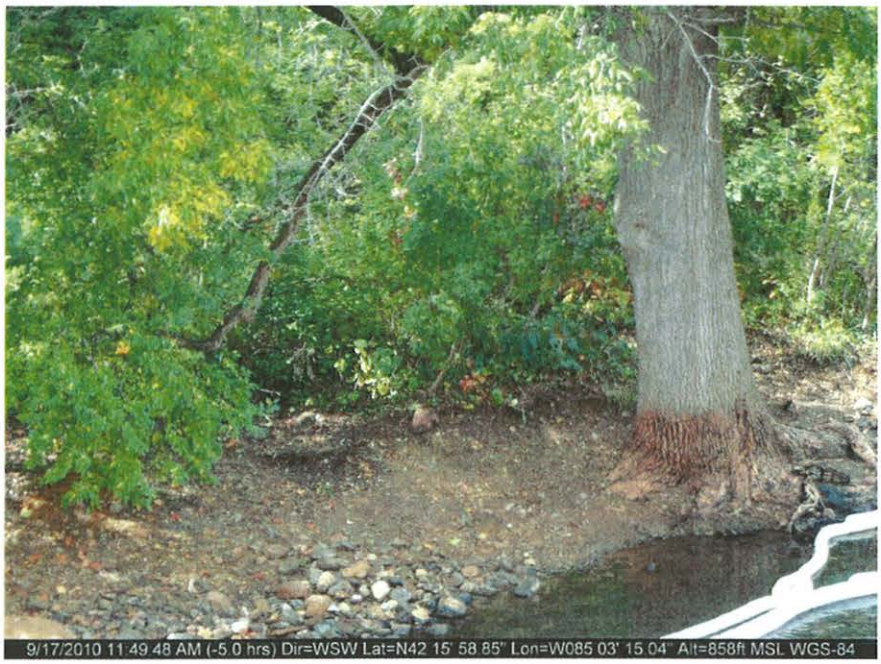
Photograph No: DSC01950

Photograph Date: 09-17-2010

Segment No: C 6.00

Habitat Type: Oiled Mixed Sand and Gravel

Description: Small cobble shoreline with tree - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC04084

Photograph Date: 08-28-2010

Segment No: C 6.00

Habitat Type: Oiled Mixed Sand and Gravel

Description: Cobble shoreline - before



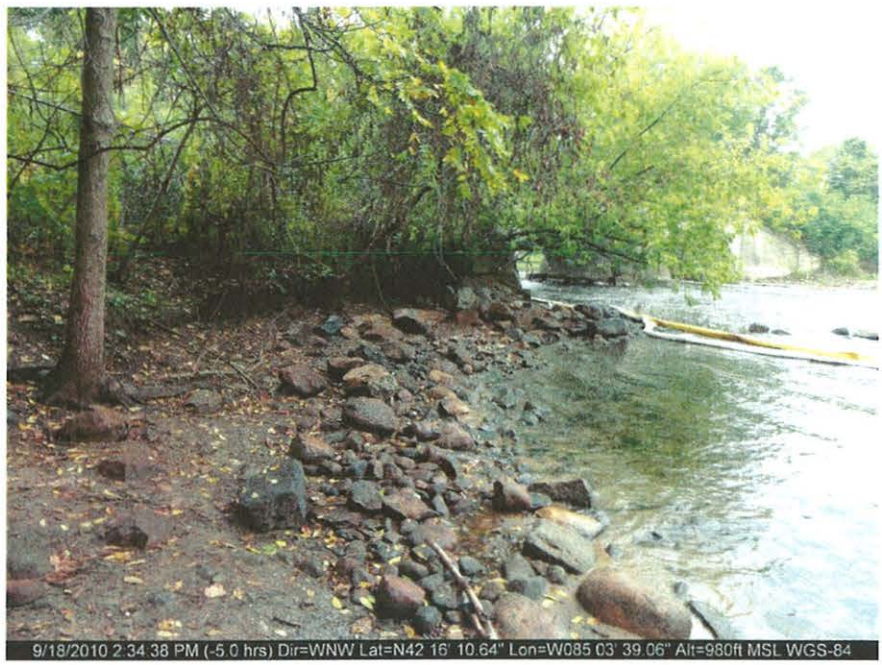
Photograph No: DSC04624

Photograph Date: 09-18-2010

Segment No: C 6.00

Habitat Type: Oiled Mixed Sand and Gravel

Description: Cobble shoreline - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC06603

Photograph Date: 09-18-2010

Segment No: C 6.00

Habitat Type: Oiled Mixed Sand and Gravel

Description: Cobble area - before



Photograph No: DSC04626

Photograph Date: 09-18-2010

Segment No: C 6.00

Habitat Type: Oiled Mixed Sand and Gravel

Description: Cobble area - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

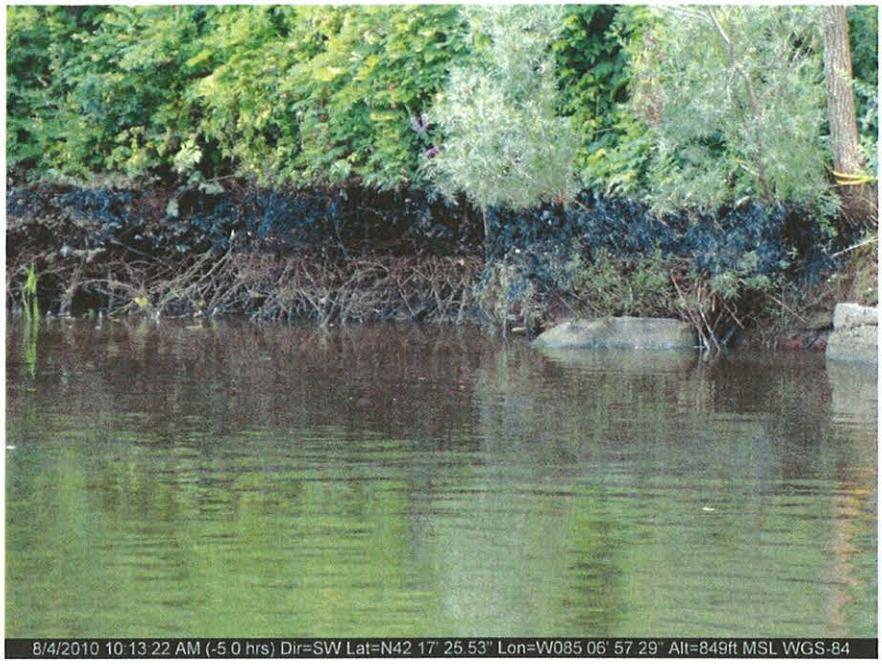
Photograph No: DSC00436

Photograph Date: 08-04-2010

Segment No: C 9.50

Habitat Type: Shoreline

Description: Oiled vegetation - before



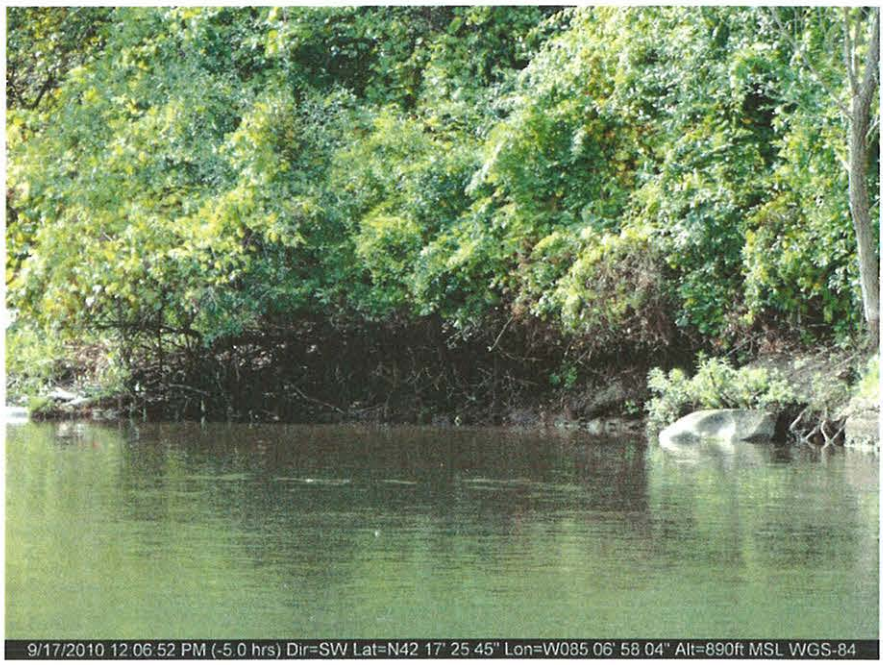
Photograph No: DSC01960

Photograph Date: 09-17-2010

Segment No: C 9.50

Habitat Type: Shoreline

Description: Oiled vegetation - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

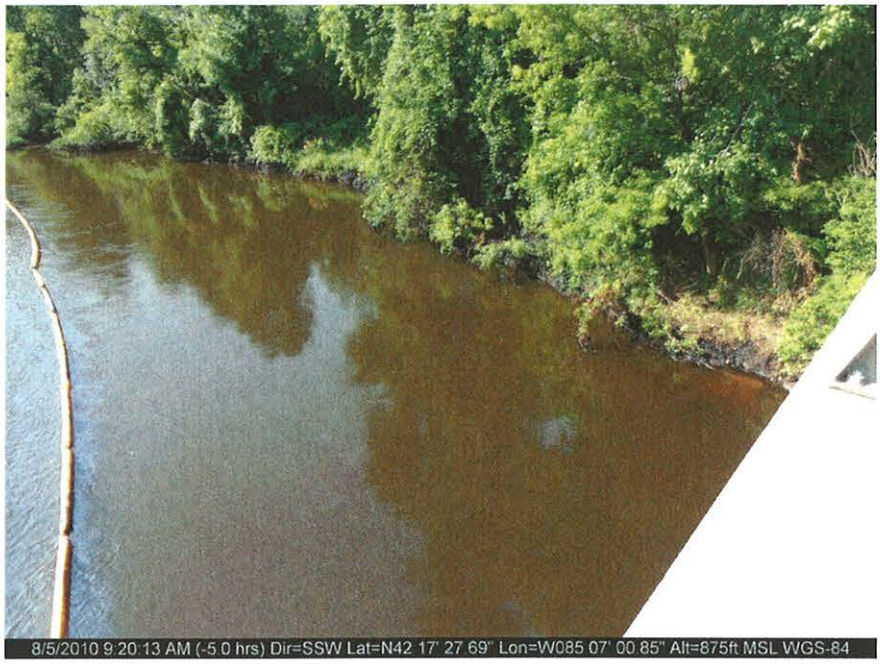
Photograph No: DSC00465

Photograph Date: 08-05-2010

Segment No: C 9.50

Habitat Type: Shoreline

Description: Vegetated shoreline - before



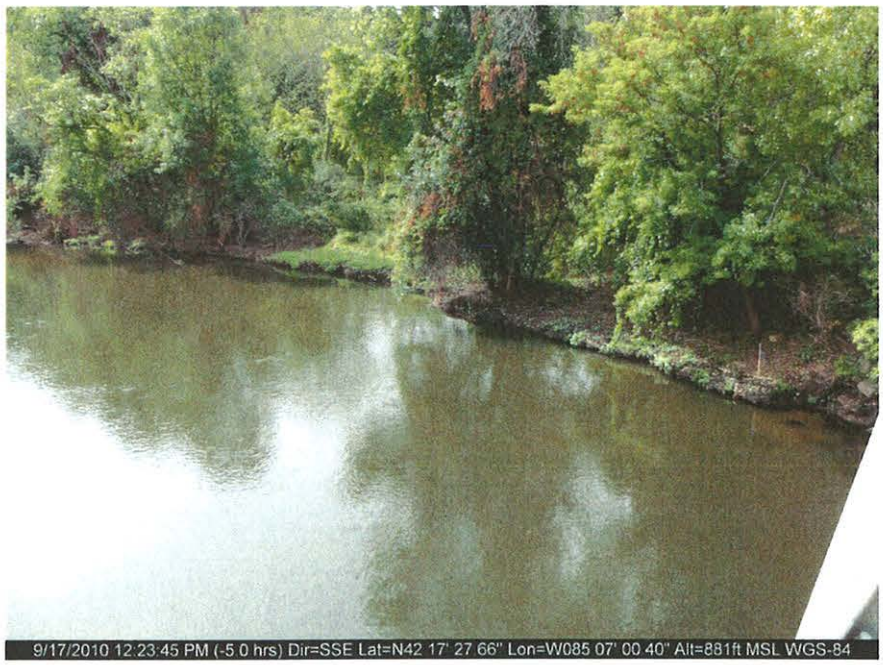
Photograph No: DSC01968

Photograph Date: 09-17-2010

Segment No: C 9.50

Habitat Type: Shoreline

Description: Vegetated shoreline - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

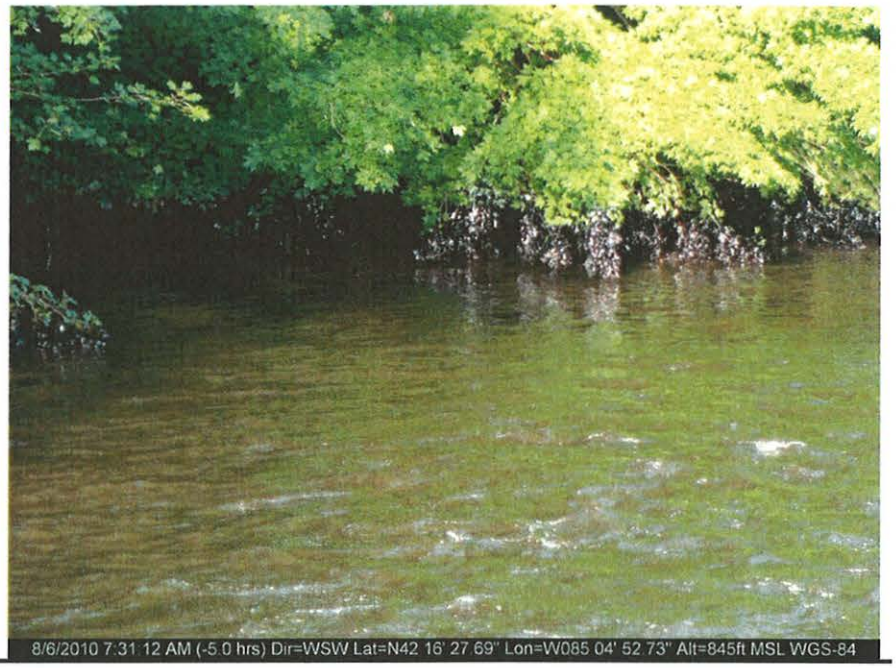
Photograph No: DSC01525

Photograph Date: 08-06-2010

Segment No: C 7.25

Habitat Type: Shoreline

Description: Shoreline vegetation - before



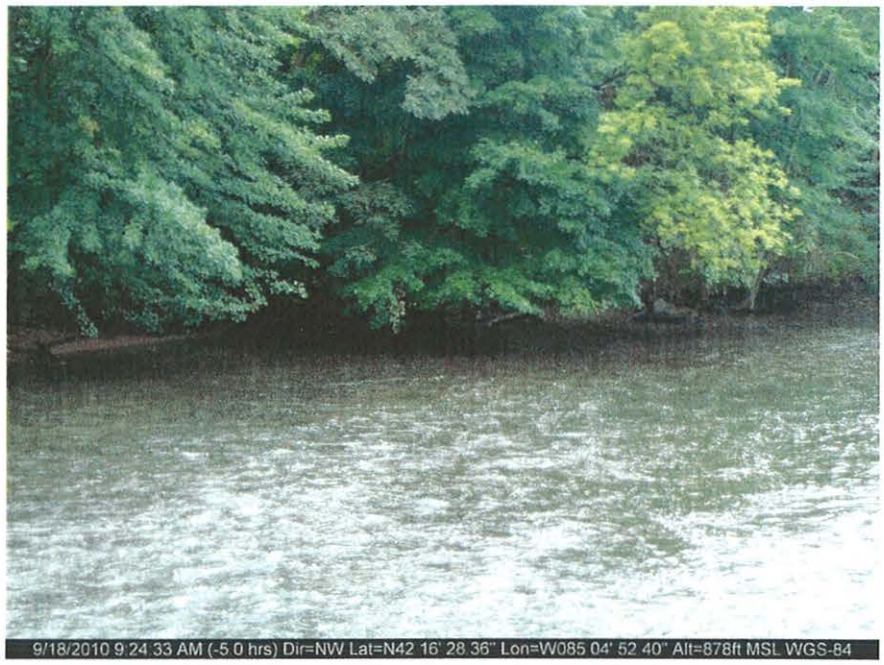
Photograph No: DSC04614

Photograph Date: 09-18-2010

Segment No: C 7.25

Habitat Type: Shoreline

Description: Shoreline vegetation - after



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00124

Photograph Date: 08-03-2010

Segment No: C 9.50

Habitat Type: Turf

Description: Boomed shoreline and turf



Photograph No: DSC01961

Photograph Date: 09-17-2010

Segment No: C 9.50

Habitat Type: Turf

Description: Boomed shoreline and turf



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC00405

Photograph Date: 08-04-2010

Segment No: C 6.00

Habitat Type: Turf

Description: Oiled shoreline and turf



Photograph No: DSC01953

Photograph Date: 09-17-2010

Segment No: C 6.00

Habitat Type: Turf

Description: Oiled shoreline and turf



Photographic Before and After Documentation of Habitats

Client: Enbridge
Site Name: Line 6B Pipeline Release
Location: Kalamazoo River, Marshall, MI

Prepared by: ENTRIX
Photographer: Burns & McDonnell

Photograph No: DSC06547

Photograph Date: 08-30-2010

Segment No: C 6.00

Habitat Type: Turf

Description: Oiled cobble shoreline and turf



Photograph No: DSC04628

Photograph Date: 09-18-2010

Segment No: C 6.00

Habitat Type: Turf

Description: Oiled cobble shoreline and turf



Enbridge Line 6B MP 608 Pipeline Release
Marshall, Michigan
Oil Recovery Report
Kalamazoo River Segment 2.25 – MP 2.0 to 2.25

Enbridge Energy

September 20, 2010

Executive Summary

The Kalamazoo River was divided into 0.25 mile segments, with a 5-step approval process approved by the EPA, MDNRE and Enbridge performed on each segment. Multi-agency SCAT survey teams characterized shoreline and overbank types, oiling conditions and provided clean-up recommendations (Step 1). After clean-up activities, Enbridge inspectors documented compliance with SCAT recommendations (Step 2). An EPA / Enbridge inspection team (Step 3) was followed by a SCAT reassessment team that performed a post-clean-up SCAT survey, verifying completion per initial SCAT recommendations (Step 4). Concluding the process (Step 5), the EPA division supervisor reviews the oil recovery report for each 0.25 mile segment and signs-off upon being satisfied that the necessary steps were completed.

Initial Assessment

The shoreline of segment MP 2.25 had very light levels of oil staining on the left descending bank and very light oil staining on the right descending bank. The left descending shoreline/overbank areas contained small areas of pooled, oil staining/coating underneath vegetation and sporadic oily vegetation and debris throughout the segment. In addition, oily mousse and sheen were observed behind containment booms, along with spotty areas of pooled oil. Zone F (EPA-C-0452) contained sporadic oiled vegetation. The island observed within the segment contained pooled oil, oiled vegetation and oiled debris. The right descending shoreline/overbank areas contained no operational focus areas requiring clean-up.

Actions

The shoreline clean-up activities within Segment 2.25 consisted of the following:

- Free/pooled oil removal through low pressure/high volume flushing and absorption methods with downstream snare and boom capture;
- Vegetation removal leaving roots intact and woody plants greater than 2" in diameter;
- Cut, bag and removal of low hanging limbs extending over and into the water 2" above oiling level;
- Scrape oiled soil and remove;
- Manual removal of oiled debris;
- Pooled oil removed.

Outcome

Oil staining was not removed to help ensure preservation of sensitive ecosystems and habitat as required by Table 2. The following conditions remain:

- Oiled herbaceous vegetation on the left descending bank in SCAT assessment zones E, F, and C;
- Oiled woody vegetation on the left descending bank in SCAT assessment zones C and D;
- Oiled soil and oiled herbaceous vegetation on the downstream portion of the left descending bank.

The left descending bank was reviewed after completion of the cleanup recommendations. Operation and maintenance (O&M) will be implemented as necessary and will include maintaining sorbent boom.

Segment 2.25 has reached the operational endpoints for oil recovery per the 5-step process. The appendices attached provide additional details on this segment.

Appendix Descriptions

The following information is included in this segment report:

- **SCAT Survey Abbreviation Sheet**
  - Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

- **Outline of 5-Step River Segment Clean-up Approval Process**
  - Table 2: Kalamazoo River/Enbridge Spill Clean-up Recommendation Methods

- **Appendix A: Step 1 SCAT Documentation**
  - Provides site details and oiling characteristics
    - Left Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials and sketch map)

    - Right Descending Bank
      - Operations Clean-up Recommendation Table
      - Figures (aerials and sketch map)

- **Appendix B: Step 2 Clean-up Operations**
  - Operations Inspection Report (OIR)
  - Segment Inspection Report (SIR)

- **Appendix C: Step 4 SCAT Reassessment Documentation**
  - Verifies that all clean-up recommendations in the initial SCAT survey have been completed
    - Left Descending Bank – Reassessment Conclusion Table
    - Right Descending Bank – Reassessment Conclusion Table

- **Appendix D: Step 1, 2, 3, 4, 5 Sign Off Documentation**
  - Contains signatory approvals and depicts progress of the segment through the 5-step process

- **Appendix E: Photographs**
  - Provides visual documentation of EPA GPS waypoints addressed

Table 1: Shoreline Oil Terminology/Codes for Spills of Black Oil

Oil Distribution			Surface Oiling Descriptors - Width	
C	Continuous	91 - 100%	Very Narrow	< ____ m
B	Broken	51 - 90%	Narrow	>____ - <____ m
P	Patchy	11 - 50%	Medium	>____ - <____ m
S	Sporadic	1 - 10%	Wide	< ____ m
T	Trace	<1%		

Surface Oiling Descriptors - Thickness

PO	Pooled Oil (fresh oil or mousse > 1 cm thick)
CV	Cover (oil or mousse from >0.1 cm to <1 cm on any surface)
CT	Coat (visible oil <0.1 cm, which can be scraped off with fingernail)
ST	Stain (visible oil, which cannot be scraped off with fingernail)
FL	Film (transparent or iridescent sheen, or oily film)

Surface Oiling Descriptors - Type

FR	Fresh Oil (unweathered, liquid oil)
MS	Mousse (emulsified oil occurring over broad areas)
TB	Tarballs (discrete accumulations of oil <10 cm in diameter)
PT	Patties (discrete accumulations of oil >10 cm in diameter)
TC	Tar (highly weathered oil, of tarry, nearly solid consistency)
SR	Surface Oil Residue (non-cohesive, heavily oiled surface sediments, characterized as soft, incipient asphalt pavements)
AP	Asphalt Pavement (cohesive, heavily oiled surface sediments)
NO	No Oil
DB	Debris: logs, vegetation, rubbish, garbage, and response items such as booms

Subsurface Oiling Descriptors

SAP	Subsurface asphalt pavement (cohesive)
OP	Oil-Filled Pores (pore spaces are completely filled with oil to the extent that the oil flows out of the sediments when disturbed). May also consist of weathered oil, such as a buried lens of asphalt pavement.
PP	Partially Filled Pores (pore spaces partially filled with oil, but the oil does not flow out of the sediments when disturbed)
OR	Oil Residue (sediments are visibly oiled with black/brown coat or cover on the clasts, but little or no accumulation of oil within the pore spaces).
OF	Oil Film (sediments are lightly oiled with an oil film, or stain, on the clasts)
TR	Trace (discontinuous film or spots of oil, an odor, or tackiness)
NO	No Oil (no evidence of any type of oil)

Sediment Types

R	Bedrock outcrops	S	Sand (0.06-2 mm)
B	Boulder (>256 mm in diameter)	M	Mud (silt and clay, <0.06 mm)
C	Cobble (64-256 mm)	RR	Riprap (man-made permeable rubble)
P	Pebble (4-64 mm)	SW	Seawalls (impermeable)
G	Granule (2- mm)		

Kalamazoo River/Enbridge Spill - Cleanup Recommendation Methods

Date: September 14, 2010 (May be revised/updated, and new date provided)

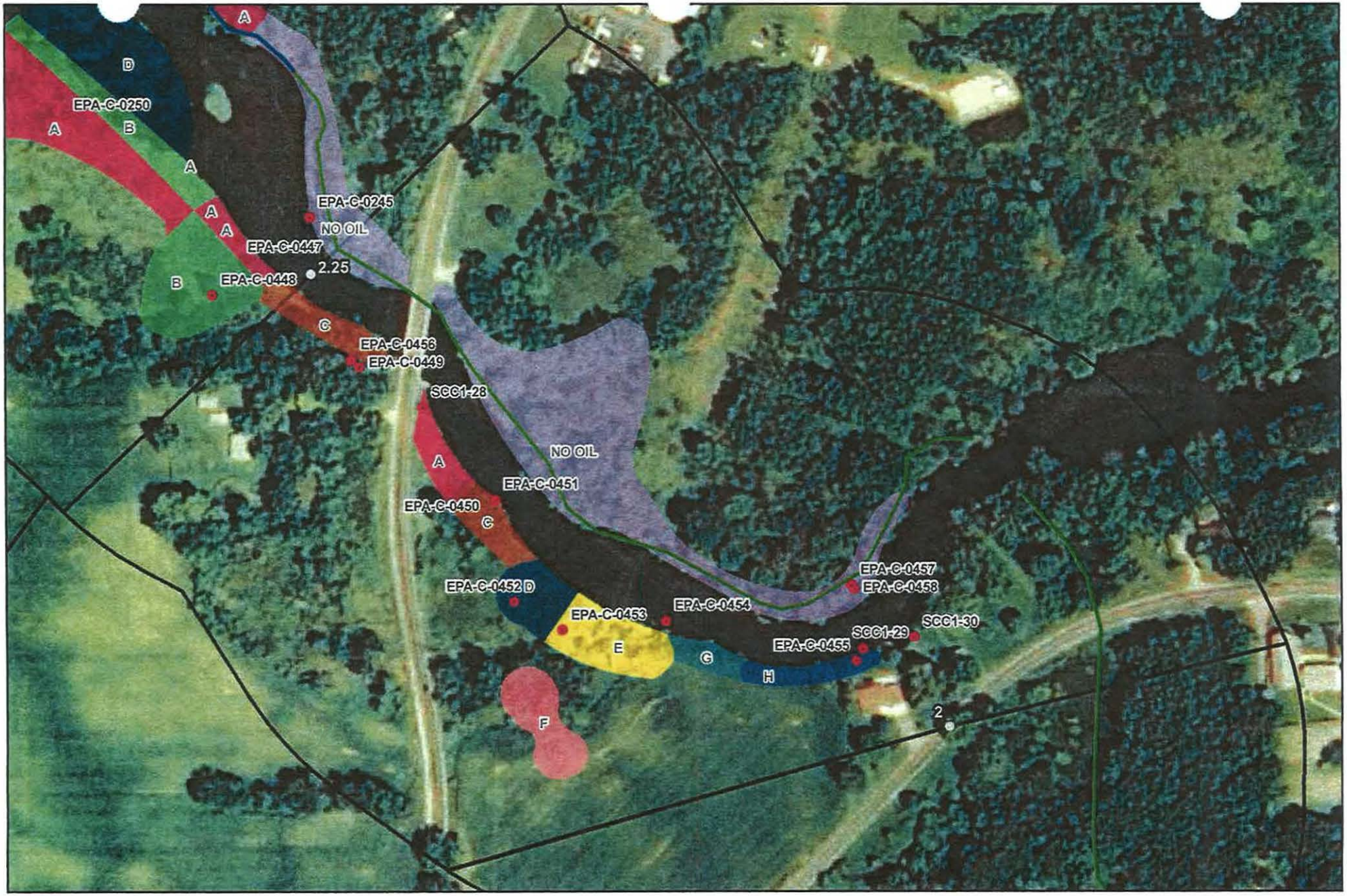
5-STEP APPROVAL PROCESS

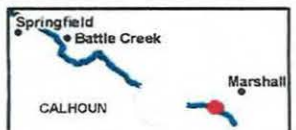
- *SCAT Review (Shoreline and Overbank)*
- *Operations / Cleanup*
- *Site Inspection*
- *SCAT Reassessment*
- *EPA Division Chief Signoff*

Habitat Type or feature	Cleanup Recommendation:	Cleanup Objective
Shoreline	• Cut and bag low hanging limbs extending over and into the water 2" above oiling level. • Remove oiled vegetation leaving roots intact up to 10' from waterline. • Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • No scraping, leave oiled soil in place.	*Meet Operational Endpoint. **Additional cleanup activities may damage the environment, result in soil erosion, and significant adverse habitat impact.
Floodplain, Oxbows, and mud areas (see attached supplement for more detail)	• Do not remove woody plants greater than 2" diameter (as measured one foot above ground surface). • Minimize ingress and egress to the least amount necessary to remove pooled oil and use planks were necessary to avoid leaving deep footprints that may drive oil into soils. • In areas categorized as pooled oil, remove oil using portable vacuum or absorption techniques (e.g. snare/pom-pons, sorbent pads). Cut and remove vegetation from around these oil pools to up to 10 ft. as needed to detect other pools of oil. • In areas with pooled oil where persistent oil occurs in moderate to heavy amounts or when oil has formed semi-solid to solid masses, manually remove oil and contaminated soil by scooping with flat shovels, rags, sorbent pads, gentle raking, gloved hands, hand tools, or similar manual methods. • In areas where absorptions and/or manual removal techniques have proven ineffective, more mechanized approaches or other countermeasures may be proposed to EPA Operations in consultation with SCAT for approval. • Do not replace removed soil with new fill. • Overbank areas greater than 100 feet from the river shoreline or an oxbow lake/pond may be addressed through natural attenuation when oil staining is minimal, or exists only as small patches or oiled deadfall.	*Meet Operational Endpoint. **Additional cleanup activities, including low pressure cold-water flushing, results in large amounts of residual oil being released into the environment and yields minimal to no removal of oil. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.

Emergent Wetlands (non-wooded)	• Minimize entry (to prevent unnecessary substrate contamination). • SCAT Team should provide cleanup recommendations on a case by case basis (recommended in areas used by sensitive wildlife). • Passive sorbent use to minimize disturbance of substrate and vegetation and to prevent excess waste generation.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by the benefits of oil removal.
Oiled debris	• Mobilize and capture oil with boom or sorbent material before and during moving debris. • Manual removal of oiled debris.	*Meet Operational Endpoint.
Oiled Manmade Structures and larger rocks	• Manual removal (scraping or wiping with sorbents on oil < 0.1 cm) • High pressure, cold water wash on oil covers (oil > 0.1cm to <1 cm thick) • Visible oil that can't be scraped off may be left in place.	*Meet Operational Endpoint. **Additional cleanup activities yield minimal to no removal of oil.
Large Woody Debris	• Oiled woody debris larger than 4" diameter should not be removed, unless it posses a safety hazard. • Mobilize and capture oil with boom or sorbent material before and during moving debris. • Oiled branches that are smaller and non-anchored to riverbank or bottom should be removed.	*Meet Operational Endpoint **Further removal may destroy existing habitats.
Aquatic vegetation holding floating oil [water lilies, grasses, etc.]	• Cut vegetation when the risk of oiled vegetation contaminating wildlife is greater than the value of the vegetation that is to be cut and there is no less destructive method that removes or reduces the risk to acceptable levels. Cut below low water's surface, leaving roots to allow re-growth. • Use snares to collect released oil. • Bag vegetation for disposal. • Operations must be strictly monitored to minimize effect of root destruction and mixing of oil deeper into the sediment.	*Meet Operational Endpoint. **Unnecessary disturbance may result in substrate contamination, habitat disruption, and is not balanced by benefits of oil removal.
Oiled mixed sand and gravel	• Boom prior to treatment. • Manual removal when significant oil presence observed. • Low pressure, cold water flushing if practical and oil can be captured.	*Meet Operational Endpoint.
Turf (private/public lawns)	• Boom prior to treatment. • Low pressure, cold water flushing if practical and oil can be captured. • Remove sod (top 2") and replace with new sod (or add soil and reseed) in areas with high oil adhesion. • Layers of solid oil, tar material, and tarmats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint
Islands	• Categorize each island based on above listed habitat type or feature. • Use cleanup recommendations for that category. • Island may be flushed to facilitate capture of oil. • Layers of solid oil, tar material, and tar mats may be removed using manual methods that may include gentle raking, removal by hand (with appropriate PPE - gloves), and hand tools.	*Meet Operational Endpoint.

*Remove oil and eliminate source of sheen **Justifications/Environmental Effects





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy
SCAT Oil Delineation Area

Division C: Mile Marker 2-2.25
Right P[illegible]k While Looking Downstream

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

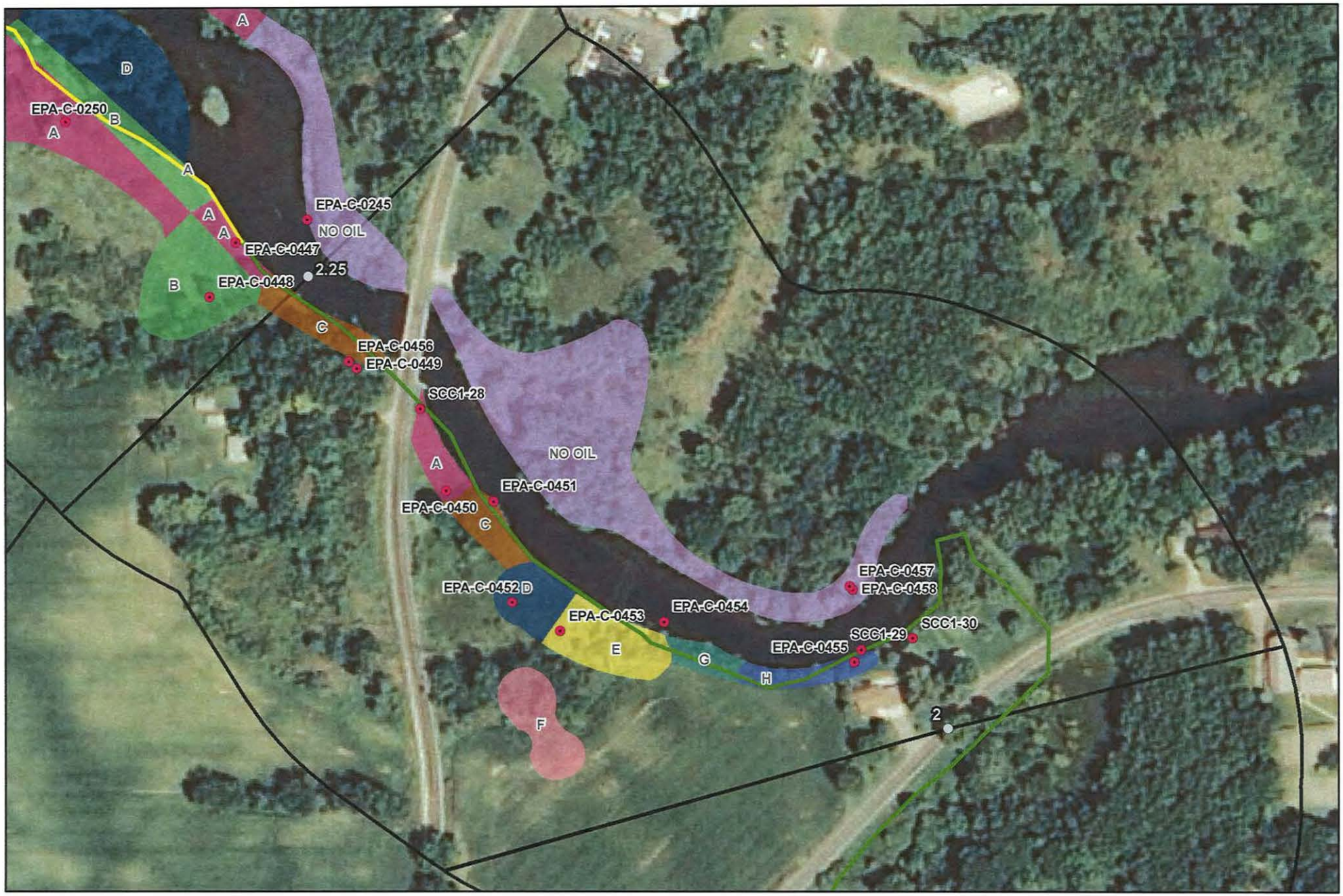
0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

[illegible]w.entrix.com

Coordinate System: NAD 1983 State Plane Michigan South Feet





River Quarter Miles
Operational Focus Area
Pooled Oil

Shoreline Oiling Category
No Oil Observed
Very Light
Light
Moderate
Heavy

SCAT Oil Delineation Area

Division D: Mile Marker 2-2.25
Left Bank While Looking Downstream

Enbridge P *e Release Incident - Kalamazoo River Oil Spill*

0 75 150 Feet

Source: Aerial Photography: USDA, 2009.

ENTRIX

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Appendix A
Step 1 - SCAT Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 2-2.25 Left Bank While Looking Downstream										
EPA-C-0447	Shoreline	SCAT T2 08/31/2010	Photo 613 shows significant sheen from banks. non continuous sheen alongshore throughout section 20 feet beyond bridge. photo 612 is looking upstream from milepost 2.25. photo 612 L US: mouse					Remove oiled vegetation leaving roots intact up to 10' from waterline.	42.25883	-84.99926
EPA-C-0448	Overbank	SCAT T2 08/31/2010	oil stain cover/ coat under veg. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25860	-84.99941
EPA-C-0449	Overbank	SCAT T2 08/31/2010	sporadic oily veg throughout 614 photo of stain on bridge. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25829	-84.99855
EPA-C-0450	Shoreline	SCAT T2 08/31/2010	spots of pooled oil. corer/ Coated veg. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25776	-84.99803
EPA-C-0451	Shoreline	SCAT T2 08/31/2010	photo 615 shows cut veg to be raked; sorbant pads already down for pooledoil. workers present had already trimmed veg. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25772	-84.99776
EPA-C-0452	Overbank	SCAT T2 08/31/2010	Zone behind F uncut oiled veg. sporadic coverage. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25728	-84.99764
EPA-C-0453	Shoreline	SCAT T2 08/31/2010	photo 612 L US: mousse and sheen observed behind booms					Cut and bag low hanging limbs extending over and into the water 2" above oiling level. Remove oiled vegetation leaving roots intact up to 10' from waterline.	42.25716	-84.99737
EPA-C-0454	Shoreline	SCAT T2 08/31/2010	oiled debris and mousse piled up behind boom. photo 612 L US: mousse and sheen observed behind booms					Cut and bag low hanging limbs extending over and into the water 2" above oiling level. Remove oiled vegetation leaving roots intact up to 10' from waterline.	42.25720	-84.99676
EPA-C-0455	Channel	SCAT T2 08/31/2010	End of section @ talmadge creek confluence; photo 616 is looking downstream from confluence of Kalamazoo River and Talmedge Creek confluence. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25703	-84.99566
EPA-C-0456	Channel	SCAT T2 08/31/2010	wouldn't let me save or delete extra zone. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25832	-84.99860
SCC1-28	Shoreline	Shoreline Assessment	•		•	•		Mechanical?	42.25812	-84.99818
SCC1-29	Shoreline	Shoreline Assessment			•				42.25708	-84.99562
SCC1-30	Shoreline	Shoreline Assessment	•		•				42.25713	-84.99532

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	Comment	Lat	Long
Division C: Mile Marker 2-2.25 Left Bank While Looking Downstream									
SCC1-28	Shoreline	Shoreline Assessment	•		•	•	Mechanical?	42.25812	-84.99818
SCC1-29	Shoreline	Shoreline Assessment			•			42.25708	-84.99562
SCC1-30	Shoreline	Shoreline Assessment	•		•			42.25713	-84.99532

Enbridge Pipeline Release In - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long
Division C: Mile Marker 2-2.25 Right Bank While Looking Downstream										
EPA-C-0457	Channel	SCAT T2 08/29/2010	no oiled conditions. photo 617 is looking downstream at confluence of Talmedge Creek. photo 618 is looking upstream from milepost 2.25. Ended segment @ talmadge creek confluence. photo 617 is looking downstream from talmadge confluence					no oil present in this segment.	42.25736	-84.99569

Appendix B
Step 2 – Clean-Up Operations

Enbridge Spill
OPERATIONS INSPECTION REPORT (OIR)

Date: 9/14/10 Time: AM / PM

Operations Division: C Segment ID: From 2.0 Start MP to End MP 2.25 Segment Length: 0.25 mile

Bank: LDB / RDB ☒ Island Overbank: LOB/ROB

Weather: Sun/Cloud/Rain/Snow/_____

Field Inspection Team

Enbridge Inspector: Ginger Gut Towner Ellen

Division Supervisor(Contractor): Doug Blakemore

LDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Clean up Completed

LOB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☑ SCAT Requirements/Clean Up Complete or NA

Clean up completed

RDB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up Completed

ROB – Description of Clean Up In-Progress/Completed and Punchlist (Inspect each item on SCAT Report)

☒ SCAT Requirements/Clean Up Complete or NA

Clean up completed

Enbridge Spill
SEGMENT INSPECTION REPORT (SIR)
Step 2

Date: 9/14/10 **Time: AM / PM**

Operations Division: 1 **Segment ID: From** 2.0 **Start MP to End MP** 2.25 **Segment Length: 0.25 mile**

Bank: LDB / RDB ☑ **Island**

Weather: Sun/Cloud/Rain/Snow/

Field Inspection Team

Enbridge Inspector: [signature]

Division Supervisor(Contractor): Wade Hennessy

SCAT Reviewed – Description of Clean Up Required

Removal of pooled oil, Cut back hanging vegetation, Bag limbs for disposal, Cut oiled vegetation

Clean Up Performed – Description of Clean Up Complete

☐ **SCAT Requirements/Clean Up Complete**

Pool oil removed hanging veg & limbs cut & Bagged grass veg removed oiled soil scraped & Removed

Punchlist Items Identified

☐ **Punchlist Items Complete** (add check on punchlist item when completed)

Appendix C
Step 4 – SCAT Reassessment Documentation

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 2-2.25 Left Bank While Looking Downstream											
EPA-C-0447	Shoreline	SCAT T2 08/31/2010	Photo 613 shows significant sheen from banks. non continuous sheen alongshore throughout section 20 feet beyond bridge. photo 612 is looking upstream from milepost 2.25. photo 612 L US: mouse					Remove oiled vegetation leaving roots intact up to 10' from waterline.	42.25883	-84.99926	Y / N
EPA-C-0448	Overbank	SCAT T2 08/31/2010	oil stain cover/ coat under veg. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25860	-84.99941	Y / N
EPA-C-0449	Overbank	SCAT T2 08/31/2010	sporadic oily veg throughout 614 photo of stain on bridge. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25829	-84.99855	Y / N
EPA-C-0450	Shoreline	SCAT T2 08/31/2010	spots of pooled oil. corer/ Coated veg. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25776	-84.99803	Y / N
EPA-C-0451	Shoreline	SCAT T2 08/31/2010	photo 615 shows cut veg to be raked; sorbant pads already down for pooledoil. workers present had already trimmed veg. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25772	-84.99776	Y / N
EPA-C-0452	Overbank	SCAT T2 08/31/2010	Zone behind F uncut oiled veg. sporadic coverage. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25728	-84.99764	Y / N
EPA-C-0453	Shoreline	SCAT T2 08/31/2010	photo 612 L US: mousse and sheen observed behind booms					Cut and bag low hanging limbs extending over and into the water 2" above oiling level. Remove oiled vegetation leaving roots intact up to 10' from waterline.	42.25716	-84.99737	Y / N
EPA-C-0454	Shoreline	SCAT T2 08/31/2010	oiled debris and mousse piled up behind boom. photo 612 L US: mousse and sheen observed behind booms					Cut and bag low hanging limbs extending over and into the water 2" above oiling level. Remove oiled vegetation leaving roots intact up to 10' from waterline.	42.25720	-84.99676	Y / N
EPA-C-0455	Channel	SCAT T2 08/31/2010	End of section @ talmadge creek confluence; photo 616 is looking downstream from confluence of Kalamazoo River and Talmedge Creek confluence. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25703	-84.99566	Y / N
EPA-C-0456	Channel	SCAT T2 08/31/2010	wouldn't let me save or delete extra zone. photo 612 L US: mousse and sheen observed behind booms					Refer to the Kalamazoo River/Enbridge Spill-Cleanup Recommendation Methods	42.25832	-84.99860	Y / N
SCC1-28	Shoreline	Shoreline Assessment	•		•	•		Mechanical?	42.25812	-84.99818	Y / N
SCC1-29	Shoreline	Shoreline Assessment			•				42.25708	-84.99562	Y / N
SCC1-30	Shoreline	Shoreline Assessment	•		•				42.25713	-84.99532	Y / N

Printed Team Members Names: Jack Boss (Enbridge) Kathleen Fairchild, DNRE Larisa Leonova, EPA *see O+M form

7/10

→ Patches of [illegible] rec. and soil (<1 FT TO [illegible] FT.) recommended FLAT SHOVEL SCRAPING TO "2"

Enbridge Pipeline Release Incident - Kalamazoo River Oil Spill

OPERATIONS CLEANUP RECOMMENDATIONS

ID	Feature	Source	Flushing	Pooled Oil Removal	Vegetation Removal	Debris Removal	General Comment	Recommendation	Lat	Long	SCAT Reassessment
Division C: Mile Marker 2-2.25 Right Bank While Looking Downstream											
EPA-C-0457	Channel	SCAT T2 08/29/2010	no oiled conditions. photo 617 is looking downstream at confluence of Talmedge Creek. photo 618 is looking upstream from milepost 2.25. Ended segment @ talmadge creek confluence. photo 617 is looking downstream from talmadge confluence					no oil present in this segment.	42.25736	-84.99569	(Y) / N

Printed Team Members Name: Kathleen Fairchild, DNRE Larisa Leonova, EPA Jack Bass, Enbridge
Date: 9/17/10
Comments:

Island

EPA-C-0458 SCAT T2 (8/31) Entire island across from Talmadge Crk. free of oil, no recommendations 42.2573 -84.99567 (Y) / N
Note: This locations reference a island in the comments, SCAT as right bank points.

Appendix D
Step 1, 2, 3, 4, 5 Sign Off Documentation

Enbridge Spill
SCAT
SIGN OFF SHEET

LOCATION
Operations Division:_____ Segment ID: From MP 2.0 to MP 2.25 Segment Length: 0.25 mile

1. **SCAT** ☑
2. **Clean up** ☑
3. **Inspection**

Signature (date) 9/14/2010 Enbridge

DAVE HOOER
Signature Eduardo Rovira (date) 9/14/10 EPA
Eduardo Rovira

4. **SCAT Reassessment**

Signature Jack W. Boss (date) 9/17/10 Enbridge

Signature (date) EPA

Signature (date) 9/17/10 MDNRE
Kathleen Fairchild

5. **EPA**

Signature LARISA LEONOVA (date) 9/17/10 EPA Division Supervisor

Christine Wagner 9/21/10

Appendix E
Photographs

Field Photo Log – Segment 2.25



Photo 0526 – Facing north at right descending bank near EPA-C-0245.



Photo 0396 – Facing northeast at right descending bank.

Field Photo Log – Segment 2.25



Photo 0397 – Facing east at left descending bank near SCC1-28.



Photo 0398 – Facing northeast at left descending bank near EPA-C-0450.

Field Photo Log – Segment 2.25



Photo 0399 – Facing northeast at left descending bank near EPA-C-0451.



Photo 0400 – Facing southeast at right descending bank near EPA-C-0452.

Field Photo Log – Segment 2.25



Photo 0401 – Facing east at right descending bank near EPA-C-0453.



Photo 0402 – Facing west at left descending bank near EPA-C-0454.

Field Photo Log – Segment 2.25



Photo 0403 – Facing west at left descending bank.



Photo 0404 – Facing north left descending bank.

Field Photo Log – Segment 2.25



Photo 0405 – Photo northeast at left descending bank near EPA-C-0455.



Photo 0406 – Facing north at left descending bank near SCC1-29 and SCC1-30.

Field Photo Log – Segment 2.25



Photo 0407 – Facing northwest at left descending bank.



Photo 0408 – Facing northwest at left descending bank.

Field Photo Log – Segment 2.25

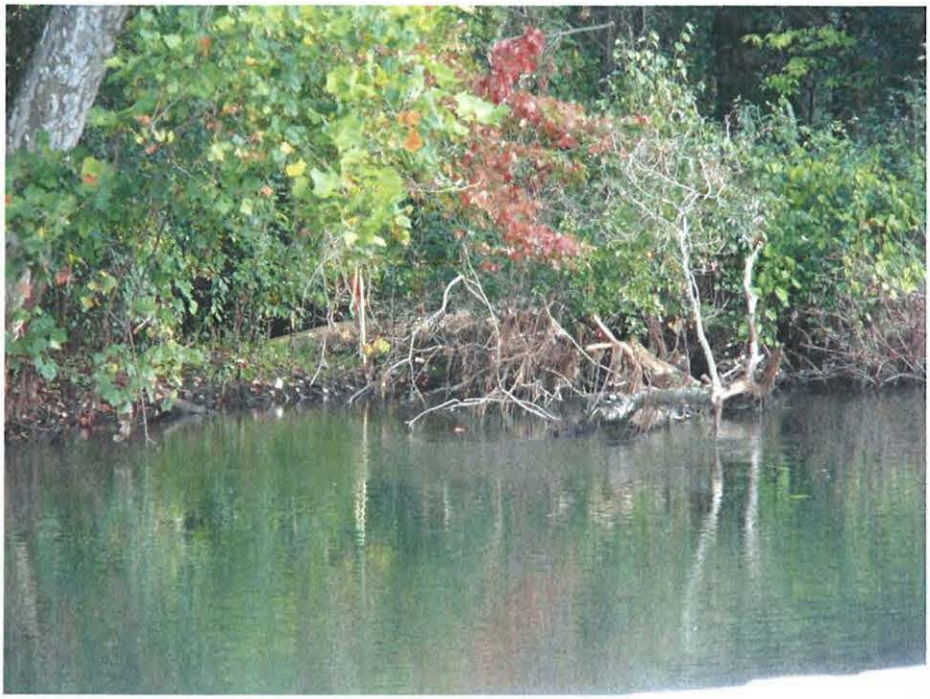

Photo 0409 – Facing north at right descending bank near EPA-C-0458.



Photo 0410 – Facing north at left descending bank near EPA-C-0488.

Field Photo Log – Segment 2.25

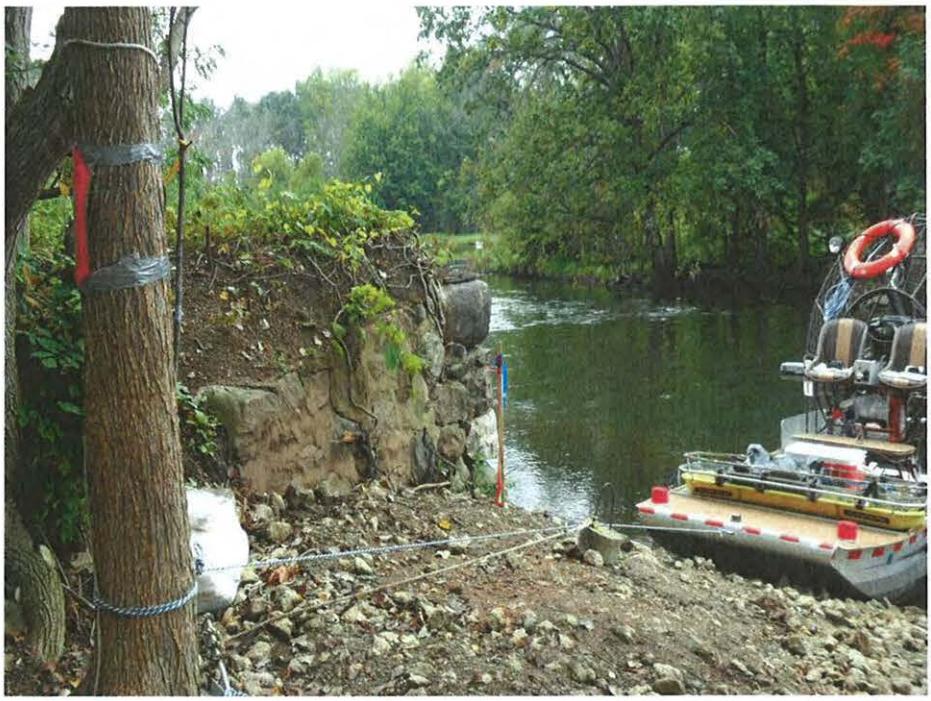

Photo 0411 – Facing northwest at left descending bank near EPA-C-0449.



Photo 0412 – Facing southwest at right descending bank near EPA-C-0447.