Enbridge Line 6B MP 608 Pipeline Release

Marshall, Michigan

Work Plan for Permanent Recovery of Submerged Oil and Oil-Contaminated Sediments at Priority Locations and Ceresco Dam Dredging

As an Attachment to the Supplemental Modification of the *Response Plan for Downstream Impact Area and the Source Area Response Plan*

Strategy and Tactics for Permanent Recovery of Submerged Oil & Oil-Contaminated Sediment

October 7, 2010

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1.0 INTRODUCTION

A Submerged Oil Task Force (SOTF) was created on Tuesday, August 24, 2010, to perform field assessment, characterization, and mapping of submerged oil impacts in surface water and sediments of Talmadge Creek, Kalamazoo River and Morrow Lake (Talmadge Creek to Kalamazoo River to River Mile Post [RMP] 40). The SOTF is comprised of representatives from the United States Environmental Protection Agency (USEPA), the Michigan Department of Natural Resources and the Environment (MDNRE), Stakeholders, and Enbridge and their contractors.

As a result of the initial field assessments, thirty four sites in the Kalamazoo River had been identified as potentially containing accumulations of significant amounts of submerged oil in river sediments. These areas were further investigated, and 18 were identified as high priority areas and were recommended for submerged oil recovery by the SOTF. These 18 priority areas were also subjected to an ecological habitat assessment intended to classify their ecological use and value to help guide cleanup operations. The SOTF discussed the assessment in conjunction with possible cleanup approaches and in a September 21, 2010 memorandum the Task Force Leaders provided recommendations for oil removal for these 18 priority areas.

Talmadge Creek was not included in the Task Force Leaders memorandum. Field assessments have been conducted along the entire 2 miles of Talmadge Creek. These assessments have identified areas in the creek that are candidates for submerged oil recovery using the same recovery techniques recommended by the Task Force Leaders for the 18 Kalamazoo River priority locations.

The purpose of this Work Plan is to describe the process for submerged oil recovery at each of the 18 priority locations and any additional sites that may be identified utilizing the recovery techniques recommended by the Task Force Leaders.

1.1 Project Scope

This project scope has been developed from the Supplemental Modification to the Response Plan for Downstream Impacted Areas (RPDIA) for Permanent Recovery of Submerged Oil and Oil-Contaminated Sediments (submitted to EPA September 11, 2010). To clearly define and present the strategies and tactics for permanent recovery of submerged oil and oil-contaminated sediments, an approach was developed to recognize the multiple types of priority locations and/or geomorphic settings that will require different types of oil recovery efforts. To address the multiple situations at each individual priority location, a "toolbox" of various associated recovery techniques was developed. The project scope covered by this Work Plan includes:

- Recommended Timing of Oil Removal Activities at each Priority Location
- Recommended "Toolbox" Technique for Oil Removal at each Priority Location
- Process for addressing newly identified Priority Locations
- Environmental Protection and Regulatory Compliance
- Mobilization and Site Preparation
- Oil Removal Activities
- Waste Management
- Project Management
- Quality Assurance/Quality Control

2.0 SITE HISTORY

The Line 6B release was reported on July 26, 2010. The oil moved over the upland approximately 1,000 feet to Talmadge Creek and was transported approximately two miles to the confluence with the Kalamazoo River. A significant amount of the oil released has been recovered and the amount of submerged oil in the Kalamazoo River and Morrow Lake systems is not known. The distance from the confluence to the dam at Morrow Lake is approximately 40 river miles. At the time of the Line 6B release the Marshall, Michigan vicinity experienced an approximately 25 -year storm event (4% chance of occurrence per year). The increase of the water elevation varied from between 7 to 9 feet. This storm event resulted in widespread overwash and breaching of the Kalamazoo River's banks, which resulted in the transport of oil into the river's floodplain.

The oil released from Line 6B was a crude oil with an American Petroleum Institute (API) gravity of 11. Generally, oil with an API gravity less than 10 will sink in water. The oil partitioned into various phases when it came into contact with the water. The phases that float have been, and continue to be collected from the water surface. The phase that is non-floating is referred to as submerged oil and this material has moved through the system below the surface and is being collected using near-term containment measures installed in the river. An unknown amount of the submerged oil was transported and deposited in the Kalamazoo River and Morrow Lake system prior to the installation of these measures.

As described in the Supplemental Modification to the RPDIA for Continuing Near-Term Containment of Submerged Oil & Oil-Contaminated Sediment submitted September 6, 2010 to address the August 27, 2010 directive received from the United States Environmental Protection Agency (USEPA), the identification and prioritization of oil deposition areas for sampling and near-term containment were evaluated.

2.1 Site Description

The 18 priority locations identified by the SOTF for permanent oil recovery are the following:

1. RMP 5.55 North and South (Ceresco Dam)
2. RMP 5.63 (Ceresco Dam)
3. RMP 5.75 (Ceresco Dam)
4. RMP 7.75
5. RMP 12.5
6. RMP 14.75
7. RMP 15.25 (Mill Pond)
8. RMP 15.5 (Mill Pond)
9. RMP 21.5
10. RMP 26.0
11. RMP 26.25
12. RMP 26.65
13. RMP 27.9
14. RMP 28.25
15. RMP 33.0
16. RMP 33.25
17. RMP 36.25
18. RMP 36.5 to 37.5 (Morrow Lake Delta)

These 18 sites are described in detail in Appendix A. The information provided for each priority location, which includes figures presenting site features, was developed to better understand site-specific characteristics to implement the recommended oil recovery technique.

In addition, new submerged oil locations identified during refined poling activities will be brought to the SOTF for consideration of containment and removal activities. Site Summaries, as prepared for the 18 priority sites, will be developed for these newly identified sites. Once the SOTF concurs with the findings and recommendations these new sites will be addressed through the removal of submerged oil and/or oil-containing sediment following the protocols developed in this Work Plan.

2.2 Nature and Extent of Submerged Oil and Oil-Contaminated Sediments at the 18 Priority Locations

Qualitative and quantitative assessments as well as ecological assessments have been completed for all 18 priority locations. As a result of the Task Force Leaders recommendation memorandum, 10 of the 18 priority locations, identified as requiring oil removal efforts (RMP 7.75; 14.75; 26.0; 26.25; 26.65; 27.9; 28.25; 33.0; and 33.25), were described as having limited habitat and/or ecological value. The Task Force Leaders recommended action at these ten locations is "reasonably aggressive steps be taken to remove the oil." The recommended technique for oil removal in these ten priority locations will rely primarily on sediment aeration, but may also include sediment skimming, flushing, raking or a combination of these. Standard Operating Procedures (SOPs) for sediment aeration for these priority locations are presented in Appendix B.

The other eight locations (RMP 5.55; 5.63; 5.75; 12.5; 21.5; 36.25; 15.25; and 15.5) were identified as having high ecological and habitat values.

Three of these locations (RMP 5.55; 5.63; and 5.75) are located in the vicinity of the Ceresco Dam. The Ceresco Dam area sediments are considered heavily oiled and due to earlier response efforts (such as the cutting of oiled vegetation) the ecological setting of this area has been impacted. Based on the impacted ecological setting the Task Force Leaders have recommended dredging in this area. A Ceresco Dam Dredging Work Plan has been developed for this area and is included in this document.

Locations RMP 12.5, 15.25, 15.5, 21.5, 36.25; and 36.5 to 37.5 (also known as Morrow Lake) are considered to be unique habitat based on the ecological assessment. The Task Force Leaders recommended that no action or less aggressive remediation steps be taken; however, less intrusive alternative actions should be considered such as cautiously raking and flushing to avoid damage to the existing flora and fauna. In addition, the Task Force Leaders recommended that the outlet booms at these locations be removed and downstream collection be adequately maintained to capture any potential releases of oil during oil recovery efforts.

3.0 OIL REMOVAL ACTIVITIES

3.1 Pre-Mobilization

In support of the oil recovery activities at each of the priority locations requiring sediment aeration as the oil removal technique the pre-mobilization activities described in subsections below will be completed. Furthermore, oil recovery pre-mobilization activities at Ceresco Dam (RMP 5.55, 5.63, 5.75N and 5.75S) are discussed in this document.

3.1.1 Coordination with Wildlife Environmental/Damage Assessment Branch to Evaluate Sensitive and/or Critical Habitat in Priority Locations

One of the key tactics to be implemented as part of the permanent recovery of submerged oil and oil-contaminated sediments in priority locations is coordination and communication with the resource agencies. Enbridge has worked with the resource agencies and the SOTF team for each of the 18 priority locations and their ecological use and value has been assessed. Based on the ecological assessments, 13 of the 18 priority locations received clearance for performing permanent oil removal activities. The remaining five priority locations are considered high quality habitat and less aggressive action at this has been recommended by the Task Force Leaders.

3.1.2 Landowner and Public Notification of Activities

Enbridge will coordinate with landowners, as necessary, and manage public notification activities.

3.2 Mobilization and Site Preparation

Key personnel and equipment will be mobilized to each priority location, following the above pre-mobilization activities and as presented in the SOP (Appendix B). Personnel will have received the Enbridge site-specific training. Training will address implementing health and safety, traffic control, spill prevention, and other relevant topics. In addition, equipment operators will be trained in the operation of vessels and aeration equipment being utilized.

Enbridge and its contractors will use the already established on-site office facilities that were set up for the project. Site preparation activities and equipment and manpower are presented in the SOP (Appendix B).

Sorbent boom will be deployed to cover the shoreline perimeter prior to the start of sediment aeration activities. Additional sorbent material will be deployed in areas within a specific priority location that contain identified sensitive habitat (See Appendix A - Community Description and Habitat Quality).

3.3 Project Meetings

3.3.1 Pre-Oil Removal by Sediment Aeration Meetings

Before any sediment aeration work begins at each priority location, the Enbridge project staff, Enbridge contractors performing this work, the USEPA, and the MDNRE will discuss the site-specific priority location. Items to be discussed in this meeting will include access to the site, work hours, site characteristics, specific health and safety issues, and general scheduling of the work.

3.3.2 Daily Safety Meeting

Enbridge and/or Enbridge contractor supervisory personnel will hold daily tailgate safety meetings to advise the workers of proper methods of performing the work planned for the day. The meetings are to be attended by all field staff, craft personnel, and subcontractor personnel. The topics of discussion will be listed on a sign-in sheet and the sheet will be kept as a record of the meeting.

3.4 Health and Safety Requirements

All personnel on the project will have participated in the Enbridge Safety Orientation for the Marshall Line 6B Release Project.

Enbridge and/or Enbridge contractor will provide oversight of activities to ensure conformance with all applicable state, local, federal and Enbridge safety requirements.

Enbridge and/or Enbridge contractor oversight staff will supervise operations and ensure strict safety conditions are maintained throughout the duration of the project. Each contractor will conduct its own site health and safety trainings/briefings during operations, personnel monitoring, enforcing/ modifying levels of Personal Protective Equipment (PPE), ensuring compliance with decontamination procedures, maintaining monitoring equipment, and documenting and reporting all health and safety related accidents or injuries. The Activity Hazard Analysis (AHA) document is attached as Appendix C.

3.5 Daily Summary Report

Enbridge and/or Enbridge contractor will prepare a daily report for each day work is performed documenting the oil recovery efforts. This report will be provided to Operations at the end of the day.

3.6 Post-Sediment Aeration Conditions Assessment

As presented in the SOP, the objective of the aeration process is to sweep the priority areas until there is "no discernable oil present on the surface." Enbridge will notify the EPA upon completion of a priority location that meets this criteria followed by a two-day "rest" period to allow for site conditions to settle. EPA will then schedule to inspect the priority location for sign off.

An initial conditions assessment was conducted by Tetra Tech for the priority locations to identify areas where submerged oil and oil-contaminated vegetation were located. The assessment was conducted as part of the early response characterization activities to identify areas of "high priority" throughout the river system. The assessment included visual observations of sheen on the water surface, poling to identify submerged oil, and sediment core collection and logging to identify visible oil in the sediment column.

Once submerged oil operations are complete and the site has been signed off by the EPA/Enbridge, a post-sediment aeration conditions assessment will be performed by Tetra Tech. This assessment will follow the same procedures used for initial site assessment upon completion of the post-sediment aeration conditions assessment, Tetra Tech will compare the initial and post-sediment aeration conditions results to determine the effectiveness of the oil removal effort. This comparison results will be summarized in a Completion Report, which will be submitted to Enbridge and EPA.

3.7 Oil Removal by Sediment Aeration, Raking, Flushing

Sediment aeration will be performed using a pond aeration unit with electric motor (explosion proof) with aluminum impeller. A diffuser panel is required at water depths less than 4 ft. The pond unit will be operated from an airboat outfitted with a platform deck. A grid system creating "cells" will be prepared during site preparation activities. A minimum of two sweeps within each grid cell is specified. If there is no discernable oil on the surface after two sweeps, the cell will be flagged as completed with a green flag. If the cell requires further aeration the cell will be flagged with red flags.

In the event that aeration procedure described above and in the SOP cannot be used due to insufficient water depth, the priority location(s) will be manually flushed, raked or a combination of the two. This is consistent with what the Task Force Leaders recommended in their memorandum dated September 21, 2010. These "Secondary Methods" for oil recovery are presented in the SOP (Appendix B). These processes will be repeated until there is no discernable oil visibly released from the cell. This SOP was originally developed for a specific set of priority sites. Please note that this SOP is now intended to cover work beyond the original ten sites referenced. In addition, new techniques may be developed as necessary and approved by the EPA to facilitate the recovery of submerged oil.

3.7.1 Containment of Priority Location

The total areas to be aerated for each priority location are presented in Appendix A. The areas already have been contained through the installation of near-term containment measures (i.e., hard booms). These existing containment measures will provide overall containment of oil brought to the surface by aeration. The sorbent boom material deployed during site preparation will also serve as containment of floating oil.

3.7.2 Recovery of Floating Oil

The floating oil will be directed to the containment areas by "leaf blowers" for collection by absorbent materials (i.e., absorbent pads, mops, snares, etc.). See Appendix B for further details on oil recovery methodology.

3.8 Decommissioning and Decontamination

Following completion of sediment aeration activities, personnel, equipment and materials will be removed from the site. Cleaning methods for equipment may include brushing and pressure washing to remove potentially contaminated material, as necessary. Media from the oil absorbing will be disposed off-site. See Appendix B for further details on decommissioning of equipment and waste disposal.

3.9 Identification of New Areas

New submerged oil locations may be identified during operation and maintenance activities around the existing 18 priority areas. These new areas will be identified to the SOTF for consideration of containment and removal activities that will be completed as part of the operation and maintenance plan. If deemed necessary, new sites will be addressed through the removal of submerged oil and/or oil-containing sediment. Site Summaries, as prepared for the 18 priority sites, will be developed for these newly identified sites.

4.0 RELEASE/SPILL REPORTING

Any releases or spills outside the contained boomed area will be immediately communicated to the appropriate Enbridge and EPA personnel. Sediment aeration activities will immediately be ceased until a notice to proceed is given.

5.0 PROJECT MANAGEMENT

The following section describes the project management team and schedule.

5.1 Project Team Organization

Enbridge and the EPA will work in unison to ensure the successful completion of oil removal by sedimentation aeration. Enbridge will direct their contractors operating the vessels and oil recovery equipment and supplies. EPA will provide a minimum of one staff personnel (or EPA START contractor) to accompany the oil removal teams. The Project Team Organization for completion of the Ceresco Dam dredging is presented in the Ceresco Dam Dredging section of this Work Plan.

5.2 Project Schedule

The timing for successful completion of sediment aeration at the priority locations is recommended prior to Winter 2010. Additionally, it is anticipated that dredging activities at the Ceresco Dam area will be completed prior to Winter 2010, which is defined as when local weather conditions would cause unsafe working conditions due to freezing temperatures and the accumulation of ice and snow.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

6.1 QC Monitoring

The overall project objective is removal of submerged oil and oil-contaminated sediments from the 18 priority locations identified in Section 2. The priority locations will be evaluated for sediment aeration effectiveness by using the quantitative assessment techniques utilized to identify the 18 Priority Locations in the river. Tetra Tech field crews will assess the aquatic vegetation for visible oil. Post-flushing assessment conditions will be compared to the pre-flushing assessment conditions and summarized in the final report.

6.2 Inspections by Regulatory Agencies

EPA has developed a written inspection/clearance procedure to guide the evaluation of the effectiveness of permanent oil recovery efforts. Forty-eight hours after the completion of the recovery efforts, Agency inspections will be conducted following these procedures. These inspections will be documented using the Submerged Oil Remediation Closure Form in Appendix D.

6.3 Inspections by Third Parties

Tetra Tech personnel working at the site will not grant site access or answer questions for unauthorized personnel. Any outside party requesting access to the site will be immediately referred to the Tetra Tech

Project Manager, who will initiate the appropriate notification of the Enbridge Project Manager and EPA.

7.0 CERESCO DAM DREDGING

The Submerged Oil Task Force (SOTF) has determined that the Amphibex dredge technology will be used for dredging at the Ceresco Dam Priority Location (MP 5.75 South). In addition, sediment removal activities will be completed in Priority Locations MP 5.55, MP 5.63, and MP 5.75 North. Specialized dredging will be completed by scraping surface sediment along the shoreline into the submerged sediments and subsequent removal. The purpose of this project is to remove the submerged oil and oil-contaminated sediment.

The project scope covered by this section of the Work Plan includes:

- Mobilization of Geotubes for sediment dewatering
- Mobilization and construction of a water treatment system
- Mobilization of material, equipment, and manpower necessary to hydraulically dredge submerged oil and oil-contaminated sediments
- Dewatering of dredged sediment
- Water treatment and discharge
- Air and water quality monitoring program

Submerged oil and oil-contaminated sediment will be removed from the north and south side of the Kalamazoo River just upstream of the Ceresco Dam (Figure 1) using an Amphibex dredge excavator and conveyed to an upland dewatering and treatment area. This process will not require an increase in the Kalamazoo River water elevation to float the equipment.

The dredged sediment will be pumped through hosing to Geotubes for dewatering with the use of polymers to enhance settling of suspended solids. Within the dewatering and treatment area, weep water will be captured in a sump, which will then be pumped to the water treatment system for treatment prior to discharge into the Kalamazoo River in accordance with a Michigan Department of Natural Resources and Environment (MDNRE) General National Pollution Discharge Elimination System (NPDES) Permit.

Additional discharge and treatment system monitoring will be required and directed on an as needed basis by the lead EPA OSC for the Ceresco Dredging Operation.

A separate work plan for air and water sampling will be submitted for review as a supplement to the existing Sampling and Analysis Plan (Revised August 17, 2010) and Quality Assurance Project Plan (Revised August 15, 2010).

7.1 Overview of Work

This work presents the proposed implementation of the submerged oil and oil-contaminated sediment removal activities at the Ceresco Dam.

7.2 Ceresco Dam Site Description

The Ceresco Dam is located between Mile Post (MP) 5.55 and 5.75, between the towns of Marshall and Battle Creek. This is one of several dams on the river operated by the Commonwealth Power Company. Ceresco Power and Light owns Ceresco Dam.

This portion of the Work Plan covers the area (as shown on Figure 1) along the left descending bank (also referred to as south shore) of the Kalamazoo River starting at the Ceresco Dam SE for approximately 1,000 feet upstream in length by 200 feet in width. The potential dredging scope of the project could include up to 6.75 acres of area as shown in Figure 1. Attempts will be made to reduce the potential dredging footprint and thus volume thru the use of alternative techniques such as aeration and raking. It is expected that newer improved versions of these techniques may develop and it is the intent of the lead EPA OSC to incorporate them as needed in consult with the SOTF. Additional dredging scope and/or the use of alternative techniques will be determined as appropriate by the lead EPA OSC for the Ceresco Dredging Operation in consult with the SOTF.

7.3 Nature and Extent of Submerged Oil and Oil-Contaminated Sediments at Ceresco Dam

Qualitative and quantitative assessments have been completed in the vicinity of Ceresco Dam and an area between approximately 2 and 3 acres in size has been identified as a high priority location requiring significant removal of submerged oil and oil-contaminated sediments. As a result of SOTF discussions, it was determined that dredging was the preferred methodology to remove these impacted sediments. This area could vary based on site conditions and overall project path forward. The depth of impacted sediments is anticipated to be variable, ranging from 0.3 feet to 1.5 feet below the mud-line.

7.4 Ceresco Dam Dredge Removal Activities

7.4.1 Mobilization

In support of dredging at the Ceresco Dam, the following pre-mobilization activities will be completed.

7.4.2 Coordination with Wildlife Environmental/Damage Assessment Branch to Evaluate Sensitive and/or Critical Habitat in Priority Locations

One of the key tactics to be implemented as part of the permanent recovery of submerged oil and oil-contaminated sediments in priority locations is coordination and communication with the resource agencies [e.g., US Fish and Wildlife Service (USFWS)]. Enbridge has worked with the resource agencies and visited and evaluated this priority location. It has been determined that the recovery technique proposed in this work plan is appropriate to the habitat. The following options have been evaluated:

- Avoiding destruction of sensitive/critical habitat
- Adjusting recovery technology accordingly, as necessary
- If permanent recovery activities destroy sensitive/critical habitat, document existing conditions prior to recovery activities for future restoration

7.4.3 Ecological Risk Assessment

It is not anticipated that an Ecological Risk Assessment will be completed prior to commencement of the dredging at Ceresco Dam.

7.4.4 Cultural Resources Assessment

Enbridge will coordinate all Cultural Resource Assessments as necessary to support this dredging effort.

7.4.5 Landowner and Public Notification of Activities

Enbridge will coordinate with the appropriate landowners and manage public notification activities. The EPA OSC lead for the Ceresco Dredging Operation will be notified of all public notifications. In addition, all public notifications will be coordinated thru the EPA Command Structure (i.e., JIC).

7.5 Mobilization and Site Preparation

Key personnel and equipment will be mobilized to the project location, following the above pre-mobilization activities. Personnel, including Tetra Tech employees and other Enbridge contractors, will have received the Enbridge site-specific training. Training will address implementing health and safety, traffic control, spill prevention, and other relevant topics. In addition, equipment operators will be trained and certified in the operation of vehicles and equipment being utilized. Prior to conducting on-site work, operators will be required to demonstrate operating abilities to the satisfaction of Tetra Tech oversight personnel.

Tetra Tech will oversee the specialty contractors, which have been procured by Enbridge:

- Dredging contractor
- Geotube and polymer provider
- Water treatment system construction and operation

Tetra Tech will use the already established on-site office facilities located at Incident Command and Brooks Airfield that were set up for the project. A site inspection will be conducted with Enbridge to determine the site preparation requirements for the project. The following site preparation will be conducted:

- Installation of Site Security and Access Controls
- Establishment of Survey Controls
- Installation of Erosion and Sediment Controls throughout the Project Work Area
- Establishment of Dewatering Pad
- Establishment of Wastewater Collection Tanks / Structures

PCi Sediment Removal and Dredging Services, Inc. (PCi) has mobilized its Amphibex amphibious excavator to the vicinity of Ceresco Dam. Support equipment includes the following:

- 2006 Mack truck with an 8500 Serco loader which will assist in the laydown of pipe as well as the launching and rigging of the dredge equipment.
- Pick-up truck and trailer is included for moving personnel and other support equipment.
- Freightliner service truck equipped with tools, supplies, welder, air compressor, crane, hydraulic hose maker, and all other equipment required to maintain and keep the mobilized equipment and operations moving efficiently.
- Other equipment will be brought in as needed.

Equipment will be staged at the equipment laydown area as shown on Figure 2. The dredge site will be staked out and sectioned off with a grid layout using polyvinyl chloride (PVC) pipe to track progress of the work. GPS point collection will be used for mapping purposes.

7.6 Project Meetings

7.6.1 Pre-construction

Before any dredging begins at the site, the Tetra Tech project staff, Enbridge, Enbridge contractors performing this work, the USEPA, and the MDNRE will meet to discuss coordination of the project. Items to be discussed in this meeting will include access to the site, work hours, specific health and safety issues, and general scheduling of the work. This meeting will also include a discussion of any known underground utilities in the proposed dredging area.

7.6.2 QC/Progress Meeting

Quality Control/Progress Meetings will be conducted once per day. These meetings will be held at the site unless otherwise requested. Any interested project team member or their designee may attend the progress meeting. Meeting minutes will be distributed by e-mail or facsimile within 24-hours of the meeting. Prior to the start of the project, an e-mail will be sent to the project team to identify persons who wish to be included on the meeting minute e-mail distribution list.

7.6.3 Daily Safety Meeting

Tetra Tech supervisory personnel will hold daily tailgate safety meetings to review hazards and advise the workers of proper methods of performing the work planned for the day. The meetings are to be attended by all field staff, craft personnel, and subcontractor personnel. The topics of discussion will be listed on a sign-in sheet and the sheet will be kept as a record of the meeting.

7.7 Health and Safety Requirements

All personnel on the project will have participated in the Enbridge Safety Orientation for the Marshall Line 6B Release Project.

Tetra Tech will provide oversight of activities to ensure conformance with all applicable state, local, federal and Enbridge safety requirements.

Tetra Tech oversight staff will supervise operations and ensure strict safety conditions are maintained throughout the duration of the project. Each contractor will conduct its own site health and safety trainings/briefings during operations, personnel monitoring, enforcing/modifying levels of Personal Protective Equipment (PPE), ensuring compliance with decontamination procedures, maintaining monitoring equipment, and documenting and reporting all health and safety related incidents or injuries. The Activity Hazard Analysis (AHA) document is attached as Appendix E.

Daily health and safety reports will also be prepared by the dredge contractor's superintendent and submitted to Tetra Tech each day of operation with the daily report.

7.8 Daily Summary Report

Tetra Tech will prepare and submit a daily report to Enbridge and EPA for each day work is performed. The report will be submitted to Enbridge and EPA by 5:00 p.m. the following business day and will include air monitoring, surface water, and water treatment data.

7.9 Post-Dredge Conditions Assessment

An initial conditions assessment was conducted by Tetra Tech for the Ceresco Dam to identify areas where submerged oil and oil-contaminated sediments were located. The assessment was conducted as part of the early response characterization activities to identify areas of "high priority" throughout the river system. The assessment included visual observations of sheen on the water surface, poling to identify submerged oil, and sediment core collection and logging to identify visible oil in the sediment column. Based on the results of the initial conditions assessment for the Ceresco Dam area, it was characterized as a "high" priority location by the SOTF. Subsequently, the Task Force Leaders recommended dredging in these Priority Locations in a September 21, 2010 memorandum.

Upon completion of the dredging activities, a post-dredge conditions assessment, similar to the initial conditions assessment, will be performed within the dredged area to document the final post-dredge conditions. Upon completion of the post-dredge conditions assessment, Tetra Tech will compare the initial and post-dredge conditions results to determine the effectiveness of the dredge removal efforts. This comparison results will be summarized in a Completion Report, which will be submitted to Enbridge and EPA. A running report of the pre and post assessments will be submitted to the EPA OSC on an ongoing basis as part of the daily report.

7.10 Sediment Removal by Hydraulic Dredging

Dredging will be performed using an Amphibex dredge, which is an amphibious excavator hybrid dredge that integrates a hydraulic cutter head dredge with a positive-displacement pump for high-solids dredged material transport. The Amphibex is versatile in its portability by flat bed truck and ability to move over ground, in shallow water, and in deeper water under its own power.

The Amphibex is 38 feet long, weighs approximately 50,000 pounds, and is powered by a 250-HP Detroit Diesel engine equipped with a silencing system which allows it to operate at low noise levels. The Amphibex is self-propelled and can sail at 8 knots. It does not require any cables for operation and it is able to move itself utilizing spuds and the bucket. The Amphibex utilizes a unique articulating arm with the dredge pump head mounted to it, allowing 3 dimensions of controlled movement. The dredge head itself is able to rotate in and out much like a bucket on an excavator, which allows for precise placement of the pumping head. The maximum digging radius is approximately 27 feet for 154 degrees. The Amphibex is also unique in its ability to work in any depth of water ranging from dry land operation to 20-feet of depth. It can "walk", "crawl", or float to the work area.

By carefully positioning the dredge and utilizing the 3 dimensions of movement, contaminated material can be removed in an efficient and safe manner. It is anticipated that the Amphibex operator will have to adapt to many unique situations as they are encountered. Several differing site conditions are expected to be encountered including, but limited to:

- Water depth
- Depth of the sediment
- Matrices of sediment

- Plants and Roots
- Debris ranging from logs, branches, stumps, rocks, trash, and other debris.

The project team has carefully reviewed the available launch sites at Ceresco Dam with consideration to the steepness of the bank, location of utilities, and other safety factors. At this time, an existing launch site at C 0.5 will be used or if needed a launch site will be constructed in conjunction with the laydown area for the Geotubes and water treatment system. The Amphibex is capable of self launching/loading provided there is reasonable slope and access to the water. The dredge is loaded onto a low-boy trailer and transported to the project site. The Amphibex is then raised up off the trailer onto spuds and outriggers; the trailer is pulled out, and the dredge is placed on the ground allowing it to push itself out into the water.

The primary area to be dredged is MP 5.75 South and located along the left descending bank of the Kalamazoo River starting at the Ceresco Dam SE for approximately 1000 feet with a width of 200 feet. This total area is approximately 2.5.acres. An attempt will be made to remove a lift of six inches of sediment from most of the oil-containing areas. Removing a precise 6-inch layer is difficult using any type of dredging method, and it is likely that 1 to 1.5 feet will be removed including an overdredge allowance of 1 foot. Additionally, sediment removal activities will be completed in Priority Locations MP 5.55, MP 5.63, and MP 5.75 North. Specialized dredging will be completed by scraping surface sediment along the shoreline (approximately 1,500 feet) into the submerged sediments and subsequent removal. It is anticipated that a minimal amount of surface sediment will be dredged along the right descending bank. The potential volumes for sediment removal of 6 inches, 1 foot and 1.5 feet is shown in the table below based on approximate acreage of each area. The potential removal volumes at MP 5.55, MP 5.63, and MP 5.75 North are not anticipated with limited surface scraping.

Mile Post Area	Approximate Acreage	6 inch Removal Volume (Est. Cubic Yards) Range Based on 30 – 50 % Solids	12 inch Removal Volume (Est. Cubic Yards) Range Based on 30 – 50 % Solids	18 inch Removal Volume (Est. Cubic Yards) Range Based on 30 – 50 % Solids
5.75 South	2.5	605 – 1009	1,210 – 2,018	1,815 – 3,027
5.75 North	1.5	363 - 605	726 – 1,210	1,089 – 1,815
5.63 - South	1.0	242 - 404	484 - 808	726 – 1,210
5.55 North	1.75	424 - 706	848 – 1,412	1,272 – 2,118
TOTAL	**6.75**	**1,634 – 2,724**	**3,268 – 5,448**	**4,902 – 8,170**

The material removed with the Amphibex will be conveyed hydraulically to Geotubes, which will serve as the preliminary method for dewatering. The dredge head is designed to take a thicker cut of material in deeper water. However, a heavy rubber skirt will be constructed on the dredge head, which will allow PCi to dredge a thinner layer of material. This will allow for the dredging operations to remove material in a more efficient operation. The pumping capabilities will fluctuate depending on the characteristics of the material, the quantity of the debris, pumping distance, and thickness of the material being moved.

Sediment will be removed, working from the shore toward the center of the river, working in 20-foot wide areas, which will be marked using a grid system with buoys or poles to track progress. PCi will also visually monitor, control, and record the depths to which sediment removal is conducted. Dredging will commence upstream and proceed downstream to reduce the potential of recontamination of a previously dredged area.

Sediment aeration was performed on September 20 and 21, 2010, in a 1 acre area at the east side of the project footprint. This work was accomplished using a pneumatic aerator. The objective of aerating this area was to prepare a relatively "clean" area for the Amphibex to enter the containment area, and to minimize mobilization of contaminants into the sediment column by the dredge.

The Amphibex will initiate removal of sediment by working outside the containment area by reaching over the hard boom. The Amphibex will enter the work area once this has been accomplished by opening the hard boom and entering the containment area where the sediment aeration and removal activity was initiated. The hard boom will be reconnected to the shoreline behind the Amphibex to provide the necessary containment for the work to proceed.

The potential dredging scope of the project could include up to 6.75 acres of area as shown in Figure 1. Attempts will be made to reduce the potential dredging footprint, and thus volume, through the use of alternative techniques such as aeration and raking. It is expected that new and improved versions of these techniques may develop and it is the intent of the lead EPA FOSC to incorporate them, as needed, in consultation with the SOTF. Additional dredging scope and/or the use of alternative techniques will be determined as appropriate by the lead EPA FOSC for the Ceresco Dredging Operation in consult with the SOTF.

7.10.1 Containment of Dredging Footprint

The proposed dredging footprint is 6.75 acres in size. Depths of submerged oil and oil-contaminated sediments are expected to range from 0.3 feet to 1.5 feet. Although the dredging footprint has been contained through the installation of near-term containment measures, sections may be bolstered by installing reinforced silt curtains, as necessary. An offset will be established at the hard boom and at the face of the bulkhead wall located on the southwest side of the dredge area. This offset is intended to minimize the potential contact of the dredge with the boom or wall.

Additional containment (skirts, booms, curtains, etc) is likely to be required by the EPA OSC lead for this action and will be directed as appropriate.

7.11 Transfer of Dredged Material

Once the Amphibex dredge is positioned inside the containment area, the slurry transfer piping connections will be made at the Amphibex and manifold at the Geotubes. Adequate piping attachments will be delivered to the staging area to support the dredging project. Booster pumps will be installed and staged on dry land at the near shore area, to be used as necessary.

7.12 Dewatering of Sediment

Sediment dredged from the vicinity of the Ceresco Dam will be pumped to geotextile tubes for dewatering, situated on a dewatering pad located in the soil handling area (Figure 2). The proposed dewatering pad is approximately 360 feet by 200 feet. The dewatering pad will be constructed by compaction of the existing soil base, installation of an impermeable liner, and placing a layer of drainage aggregate as a working surface. Approximately 12 Geotubes will be delivered to the site to facilitate the dewatering process. A geocomposite may potentially be substituted for the aggregate and used as the working surface.

7.12.1 Geotube Operations

Geotubes will be factory rolled and delivered to the site on flatbed trucks. The Geotubes will be individually wrapped and labeled for length and direction of unroll. Forklifts and/or All-Terrain Vehicles (ATVs) will be used to deploy the Geotubes in the dewatering pad. Site personnel will inspect the unrolled Geotubes for evidence of damage prior to its intended use. Figure 4 and 5 provide layout details regarding the Geotubes.

The dredged sediment will consist of an approximate 8 percent slurry mixture. The mixture is pumped into a header pipe then distributed into a manifold system with valves to direct the flow of the slurry into non-woven textile tubes, also referenced as Geotubes. This system, located at 13200 12 Mile Road, utilizes a flocculent to settle out the solids while a pump is connected to the other end to aid in the removal of water. The material safety data sheet for the flocculent is provided in Appendix G. Once a Geotube is full, flow is diverted to another Geotube while the full Geotube dewaters. The Geotubes will go through “fill and rest” cycles until it reaches its full capacity as per the manufacture’s specifications. Operators will continuously monitor the Geotubes during filling and will also monitor shrinkage in Geotubes prior to fill cycles to evaluate the remaining capacity of each Geotube.

Once the Geotube is full of sediment and dewatering is sufficient, it will be cut open to allow an

excavator to place the sediment into an appropriate transportation container. Depending on the nature of the sediment, the material will either be directed to an appropriate landfill for disposal or be taken to Project Site A for appropriate solidification prior to being sent offsite for disposal.

Prior to the dewatered sediment being removed for disposal, waste characterization will be required. Sediment waste characterization of each Geotube will be determined by dividing each Geotube into four quadrants based on the actual dimensions of the Geotube (200 ft long and 60 ft in circumference). Composite sediment samples will be collected from each quadrant by collecting sediment from four unique locations in the quadrant utilizing an excavator bucket. A total of four composite samples per Geotube will be collected and submitted to Merit Laboratories, East Lansing, MI, for chemical analyses. The complete analyte list is summarized below and will include percentage solids composition.

- TCLP metals
- TCLP VOC
- TCLP Semi-VOC
- Paint filter test for free liquids
- pH
- Flashpoint
- TPH (DRO-GRO)
- Oil & Grease
- PCBs
- Percent solids
- Analyte criteria for solidification versus disposal at landfill

Total Petroleum Hydrocarbon/Oil & Grease sampling will be conducted according to the SAR and QAPP.

7.12.2 Containment and Collection of Weep Water

The dewatering pad will be designed with a berm to contain water. It will also be designed to slope towards a 30-foot by 65-foot by 5-foot deep sump which represents approximately 72,935 gallons of capacity (one hour of water treatment system capacity). The water drained to the dewatering pad (i.e., weep water), along with stormwater, will be collected in this sump and treated in an on-site temporary water treatment plant. The 2-acre containment area pad with the associated berm will allow for a containment capacity of approximately 400,000 gallons which can used for storage should the dredging operation produce more water than the system is capable of handling. The water treatment system can then be operated beyond the timeframe of the day's dredging activities should it be needed to treat the water from that day's dredging work.

7.13 Water Treatment and Discharge

Water collected in the sump will be pumped to a water treatment system which includes bag filters with oil grabbing bags, oil absorbing pressure vessels (i.e., organoclay cans), and Granular Activated Carbon (GAC) vessels as presented in Figure 3. The treatment system will be sized to meet the discharge requirements of <20 parts per billion (ppb) of total benzene, toluene, ethyl benzene, and xylene (BTEX). The water treatment contractor will provide a licensed Wastewater Treatment Operator and treatment system operators to assure that the discharge requirements are met as per the NPDES permit as follows:

- Total benzene, toluene, ethyl benzene, and xylene (BTEX) - 20 ug/l
- Dissolved oxygen (DO) - 4.0 mg/l

- pH 6.5 to 9 S.U.

The anticipated flow rate is to between 1,500 and 2,000 gallons per minute (gpm) with a maximum capacity of 2,250 gpm. This flow rate can be adjusted manually based on the level of water within the dewatering pad and the efficiency of the downstream equipment. Figure 3 illustrates the Process Flow Diagram for the maximum permitted capacity of 2,250 gpm.

There are two bag filters arranged in parallel, which utilize fabric filters to physically separate solids and oil from the stream of water. The effluent from the bag filters is passed through a vessel filled with organoclay, which removes additional oil from the water stream. The two oil absorbing vessels are piped in series (lead-lag). The bag filters and organoclay cans act as a buffer for the GAC vessels, intercepting contaminants that would otherwise foul the GAC filter media and shorten their service life.

The GAC vessels will provide tertiary water treatment prior to discharge back to the Kalamazoo River. Two GAC vessels are piped in series (lead-lag) for a single treatment train. Each vessel contains 10,000 pounds of GAC and the series of two vessels is designed to treat 750 gpm. Three treatment trains identified as A, B, and C are connected to operate in parallel to treat between 1,500 and 2,000 gpm with a maximum capacity of 2,250 gpm. The differential pressure across the GAC vessels is monitored for signs of plugging and/or physical fouling due to suspended solids and/or biological growth. Backwash of the bed is initiated when the differential pressure across the vessel reaches 15 pounds per square inch, or twice that of a clean bed. The backwash water will be returned to the sump for treatment and ultimate discharge.

This treatment plant will discharge treated water back to the Kalamazoo River and operate under a NPDES Certificate of Coverage (No. MIG081158) issued by MDNRE. Treated water will be continuously discharged in accordance with the NPDES permit. Effluent will be discharged into the Kalamazoo River using a vertical riser pipe with a dispersion cap. The discharge pipe and vertical riser will be mounted to a floating dock approximately 40 feet from shore. The discharge point will be monitored at least three times per week to confirm no riverbed erosion is occurring. In the event that allowable levels in the NPDES permit are exceeded, the dredging, dewatering, and filtration systems will be turned off while the cause of the exceedances is investigated and corrective actions are taken.

Additional discharge and treatment system monitoring will be required and directed on an as needed basis by the lead EPA FOSC for the Ceresco Dredging Operations.

An odor masking agent will be procured and used on-site to ameliorate potential odor issues associated with materials handling. The Material Safety Data Sheet (MSDS) for this product will be submitted to the EPA FOSC for this project for approval prior to initiation of its use.

7.14 Demobilization and Decontamination

Following completion of dredging/dewatering activities, temporary facilities and utilities, personnel, equipment and materials will be removed from the site. Construction equipment will be decontaminated before leaving the site. Cleaning methods for equipment may include brushing and pressure washing to remove potentially contaminated material, as necessary. As part of decontamination efforts, all non-porous surfaces (e.g., pipes, fittings, appurtenances, pumps, vessels) that have come into contact with sediment and/or filtrate will be cleaned as follows:

- All portions of the sediment dewatering and water treatment systems will be flushed in place with river water supplied by the Amphibex dredge. Rinsing will be considered complete when at least one hour's pumping of river water has passed through the system.
- After rinsing is complete, the system will be drained and discharged to the river.
- Media from the oil absorbing and GAC vessels will be disposed off-site at an approved facility.
- Rental equipment will be demobilized from the site.

Wastes generated during decontamination will be managed in accordance with the approved Waste Transportation and Disposal Plan.

7.15 Completion Report

A Completion Report will be prepared and submitted to Enbridge, EPA and MDNRE upon completion of the dredging/dewatering activities. The report will include at a minimum a summary of the work performed, pre- and post-dredge condition assessment information, daily field reports, and photographic documentation.

7.16 Waste Management

Waste generated during the dredging and dewatering activities will be handled accordance to the EPA approved Waste Management Plan for Dredging Operations Located at MP 5.75 South.

7.17 Field Sampling and Analysis Plan

The media to be sampled for this project (as covered under this Work Plan) will be water treatment system effluent, in compliance with the NPDES permit, dewatered sediment and debris for landfill disposal characterization. Initial influent and effluent water samples will be collected during the first day of operation to ensure treatment effectiveness. Water samples will be collected in accordance with the NPDES permit. Additional discharge and treatment system monitoring will be required and directed on an as needed basis by the lead EPAOSC for the Ceresco Dredging Operation.

At treatment plant start-up, a water sample will be taken of the influent, effluent, and the intermediate stages between the carbon vessels and chemically analyzed for BTEX, total lead, dissolved oxygen (DO) and pH. Thereafter, the intermediate and effluent stage of the carbon vessels will be sampled once a week for BTEX. The effluent maximum concentration limit for BTEX is 20 ug/l. The intermediate concentration is to be measured and reported, but does not have a limit. The concentration levels will be reported to the state on a weekly and monthly average basis. The samples will be sent to Merit Laboratories, East Lansing, MI, with duplicate, lab Matrix Spike and Matrix Spike Duplicate (MS/MSD) and rinsate samples collected for every 10 samples collected in the field.

Total lead, DO, and pH will be tested on a weekly basis. Dissolved Oxygen has a minimum concentration level limit of 4.0 mg/l; pH level between 6.5–9 must also be maintained. Total lead testing is required for reporting and has a total quantification level of 1.0 ug/L, but is not subject to concentration limitations.

The samplings for BTEX, DO, pH and total lead at the effluent will be taken prior to mixing with the surface water. The intermediate stage monitoring will be taken prior to the final activated carbon stage.

Flow will be monitored daily in MGD and logged on a daily and monthly basis. The water treatment equipment, the discharge point and the receiving waters will be inspected at a minimum three times a week.

The discharged water will not contain any turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits of unnatural quantities which are or may be harmful to the receiving water bodies.

NPDES PERMIT SAMPLING PARAMETERS AND FREQUENCY				
Parameter	**Minimum Limits for Quality and Concentration**	**Maximum Limits for Quality and Concentration**	**Frequency of Analysis**	**Sample Type**
Intermediate Total BTEX	-	(report)	Weekly	Grab
Final Effluent BTEX	-	20 ug/L	Weekly	Grab
Total Lead	-	(report)	Weekly	Grab
Dissolved Oxygen	4.0 mg/l	-	Weekly	Grab
pH	6.5	9.0	Weekly	Grab
Equipment and Outfall Inspections	-	(report)	3X Weekly	Visual

These test parameters are in accordance with, or exceed, the NPDES Wastewater Discharge General Permit for Petroleum Contaminated Wastewater Permit Certificate of Coverage Number MIG081158.

Waste characterization of construction debris consisting of the Geotubes and PPE will be analyzed for the following analytes:

- TCLP metals
- TCLP VOC
- TCLP Semi-VOC
- Paint filter test
- pH
- Flashpoint
- TPH (DRO-GRO)
- Oil & Grease
- PCBs
- Percent solids

Once the debris has been appropriately characterized for disposal, the debris waste generated from the sedimentation removal operations will be managed in accordance with the Enbridge Contaminated Soil Pile Management and Sampling Plan Revised 09012010 Rev3.

7.18 Environmental Protection and Regulatory Compliance

This section summarizes the regulatory requirements applicable to the project.

7.18.1 Michigan NPDES Permit

The NPDES Certificate of Coverage (No. MIG081158) was issued by the MDNRE on September 22, 2010.

7.18.2 Michigan Part 303 Wetlands Protection Permit

The Michigan Part 303 Wetlands Protection Permit is currently being prepared. The permit application also includes the Part 301 Water Quality Permit.

7.18.3 Release/Spill Reporting

Any releases or spills outside the contained bermed area will be immediately communicated to the appropriate Enbridge and EPA personnel.

A project-specific Ceresco Dam Dredging response plan for potential spills resulting from dredge pipe releases will be developed.

7.19 Project Management

The following section describes the project management team and schedule.

7.19.1 Project Team Organization

As the oversight contractor, Tetra Tech will be responsible for ensuring the successful completion of the Ceresco Dam dredging work. Tetra Tech will retain overall project responsibilities from management through safety and quality oversight. The team structure will include the following:

- Dredging – Pci Sediment Removal and Dredging Services/Young's Environmental Cleanup, Inc.
- Geotube and polymer provider – Infrastructure Alternatives, Inc.
- Water treatment system construction and operation
- Oversight – Tetra Tech

7.20 Project Schedule

See Appendix E for a project schedule.

7.21 Quality Assurance/Quality Control

7.21.1 Organization and Responsibilities

Tetra Tech's oversight personnel will supervise the dredging project to ensure it is performed in accordance with this Work Plan and applicable local, state, and federal requirements.

7.21.2 QC Monitoring

The overall project objective is removal of recoverable oil from this priority location. The priority

location will be evaluated for dredge effectiveness by using the identical quantitative assessment techniques utilized to identify the 18 Priority Locations in the river. Tetra Tech field crews will assess the water surface for visible sheen. Poling will be conducted to identify presence of submerged oil. Hand sampling will be performed to collect subsurface sediment cores for logging in an attempt to identify visible oil in the sediment column. Post-dredge assessment conditions will be compared to the pre-dredge assessment conditions and summarized in the final report.

7.21.3 Inspections by Regulatory Agencies

Regulatory personnel will be onsite frequently and made aware of project activities through daily planning and progress meetings.

7.21.4 Inspections by Third Parties

Tetra Tech personnel working at the site will not grant site access or answer questions for unauthorized personnel. Any outside party requesting access to the site will be immediately referred to the Tetra Tech Project Manager, who will initiate the appropriate notification of the Enbridge Project Manager and EPA.

FIGURE 1 – SITE MAP

Surface Water/Manta

6

Surface Water

5.75 North

Large amounts of submerged oil (sheen and globules after agitation) but less soft sediment than south side, especially near shore. Buoys dropped during poling to delineate channel-side edge of submerged oil.

5.55 - North

Significant surface sheen made submerged oil more difficult to isolate, but similar setting to opposite side of channel. Buoys dropped during poling to delineate channel-side edge of submerged oil. Upstream extent variable over multiple visits.

5.75 South

Significant soft sediment with large amounts of submerged oil (sheen and globules after agitation). Buoys dropped during poling to delineate channel-side edge of submerged oil.

5.75

Approximate river access for dredge piping.

Approximate river access for discharge piping.

5.5

5.63 - South Area 37

Significant soft sediment with large amounts of submerged oil (sheen and globules after agitation).

Surface Water/Manta

N

W E

S

0 200 400 Feet

1 inch = 150 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid
- Air Sample Locations
- Surface Water
- Surface Water/Manta

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

FIGURE 1: SITE VICINITY
Ceresco Dam

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 30, 2010

TETRA TECH EC, INC.

9/30/10 -- K. Bellrichard

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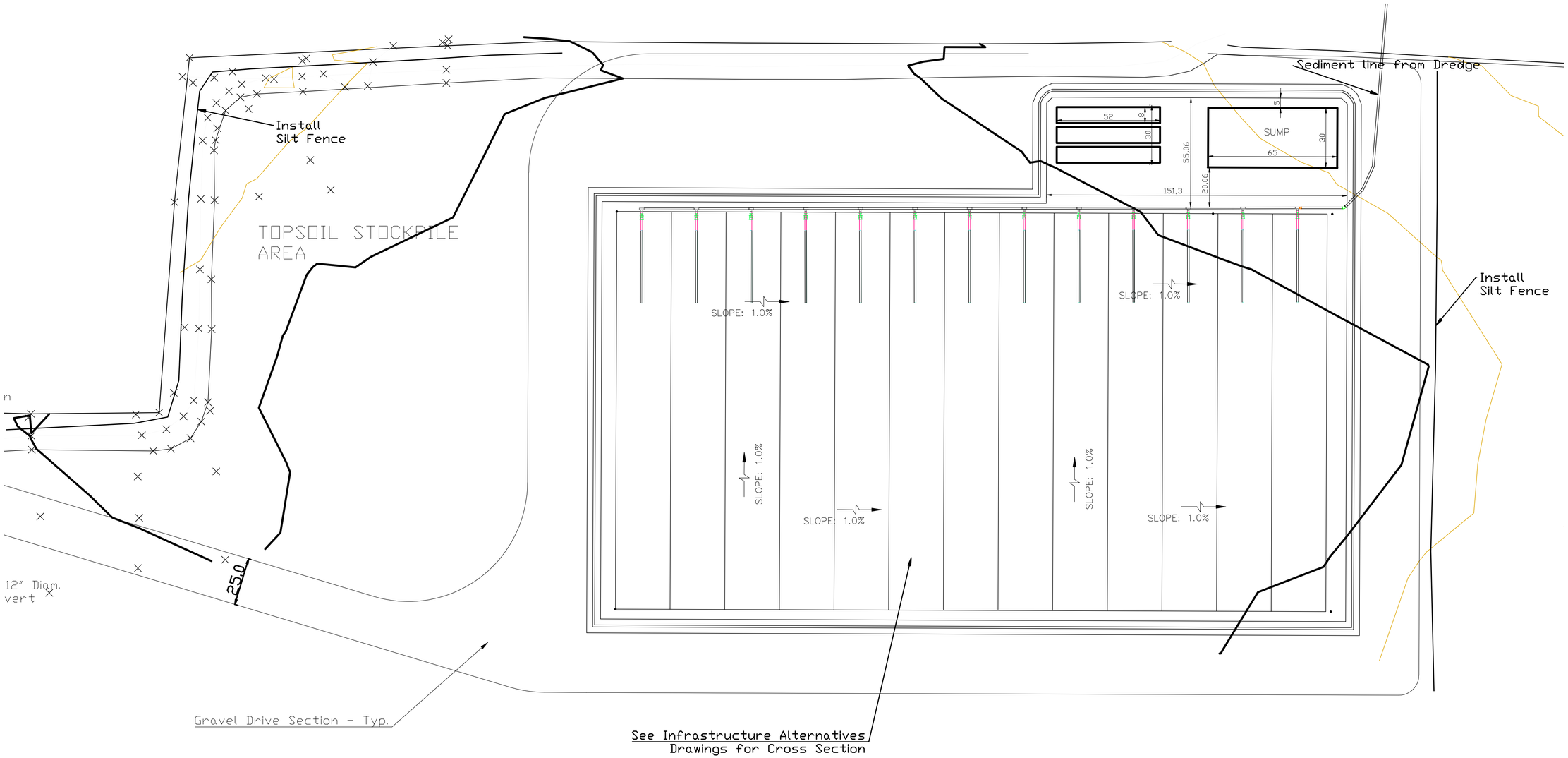
FIGURE 2 – SEDIMENT HANDLING PAD



INFRASTRUCTURE
ALTERNATIVES
2900 OAKDALE AVENUE NE, ROCKFORD, MICHIGAN 49341
phone: 616 866-1600 fax: 616 866-1611 web: www.INFRASTRUCTUREALTERNATIVES.com

NO.	REVISIONS	BY	DATE
1			
2			
3			
4	REVISED IN ACCORDANCE WITH CONSTRUCTION RECORDS		

NO.	REVISIONS	BY	DATE
5			
6			
7			
8			

Kalamazoo River

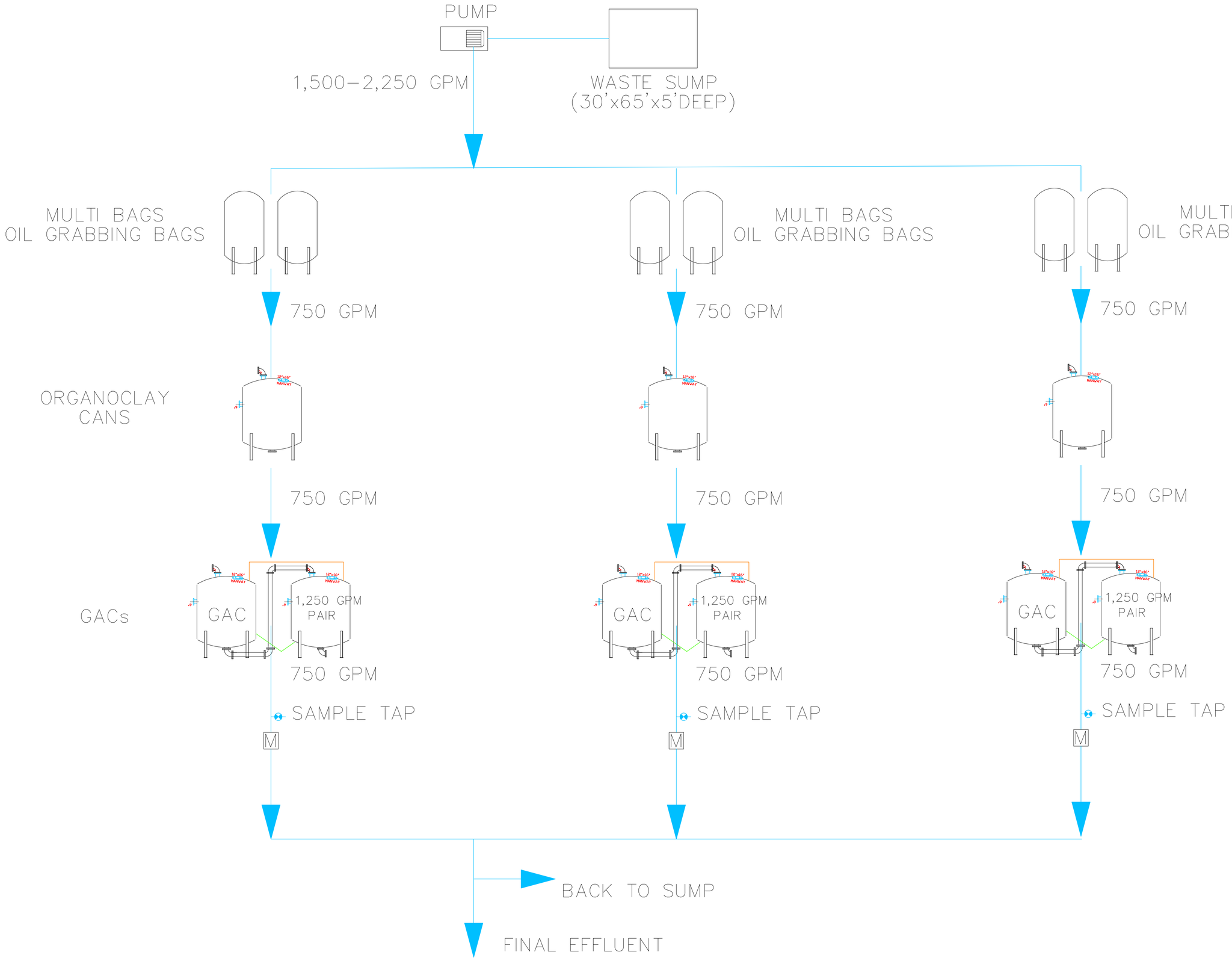
PROPOSED LAYDOWN AREA

DESIGNED BY AW	DATE 9/10
DRAWN BY AW	DATE 9/10
CHECKED BY	DATE
FILE	EDIT
SCALE	1"=16'
DRAWING	1:1
PLOT	
PROJECT K-Zoo River	

2

SHEET NO.

FIGURE 3 – PROCESS FLOW DIAGRAM



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Kalamazoo River

MASS BALANCE

DESIGNED BY AW	DATE 9/10
DRAWN BY AW	DATE 9/10
CHECKED BY	DATE
FILE	EDIT
SCALE	NTS
DRAWING	1:1
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PROJECT K-Zoo River	
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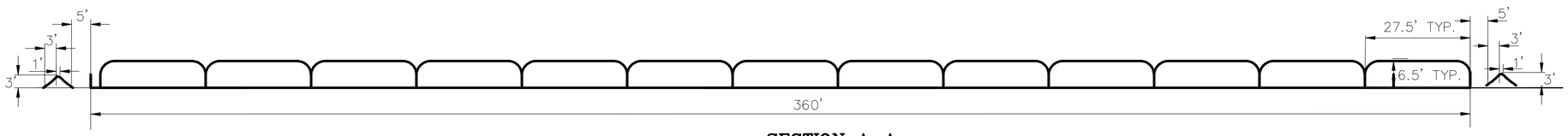
FIGURE 4 – GEOTUBE LAYOUT

PROPOSED LAYDOWN AREA
SCALE: 1"=16'



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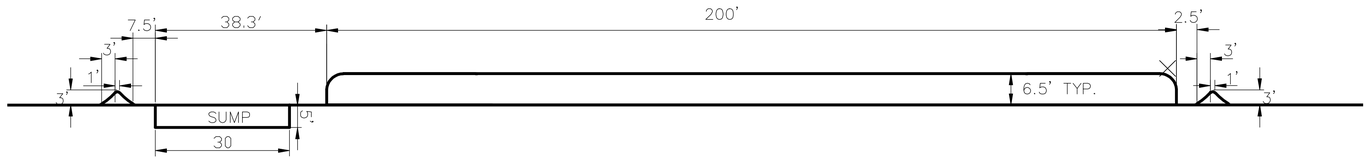

SECTION B–B
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Kalamazoo River

Figure 4 – Geotube Layout

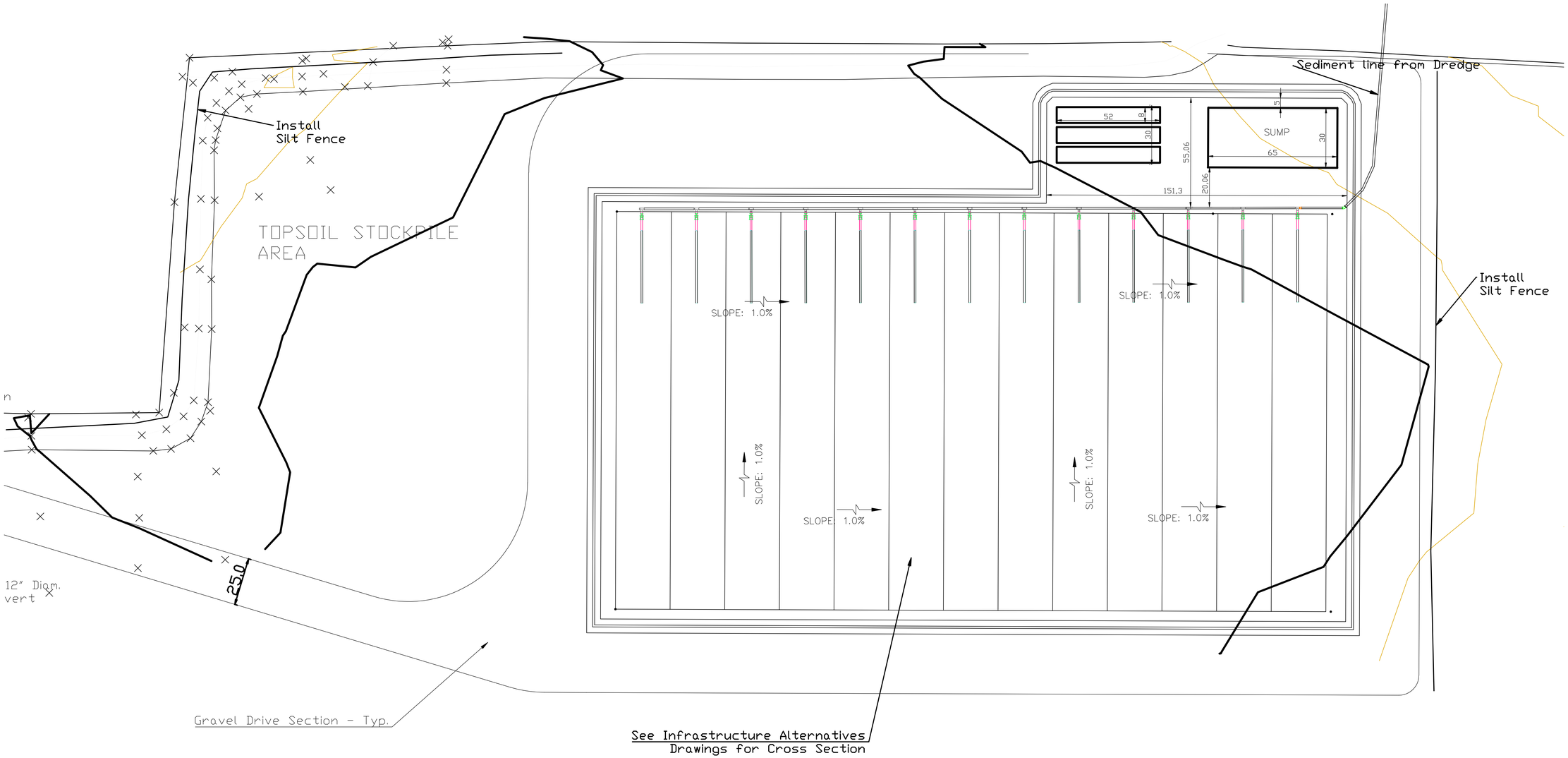
DESIGNED BY AW	DATE 9/10
DRAWN BY AW	DATE 9/10
CHECKED BY	DATE
FILE	EDIT
SCALE 1"=16'	
DRAWING 1:1	
PLOT	

PROJECT K-Zoo River

4

SHEET NO.

FIGURE 5 – GEOTUBE HEADER PIPE LAYOUT



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4	REVISED IN ACCORDANCE WITH CONSTRUCTION RECORDS		
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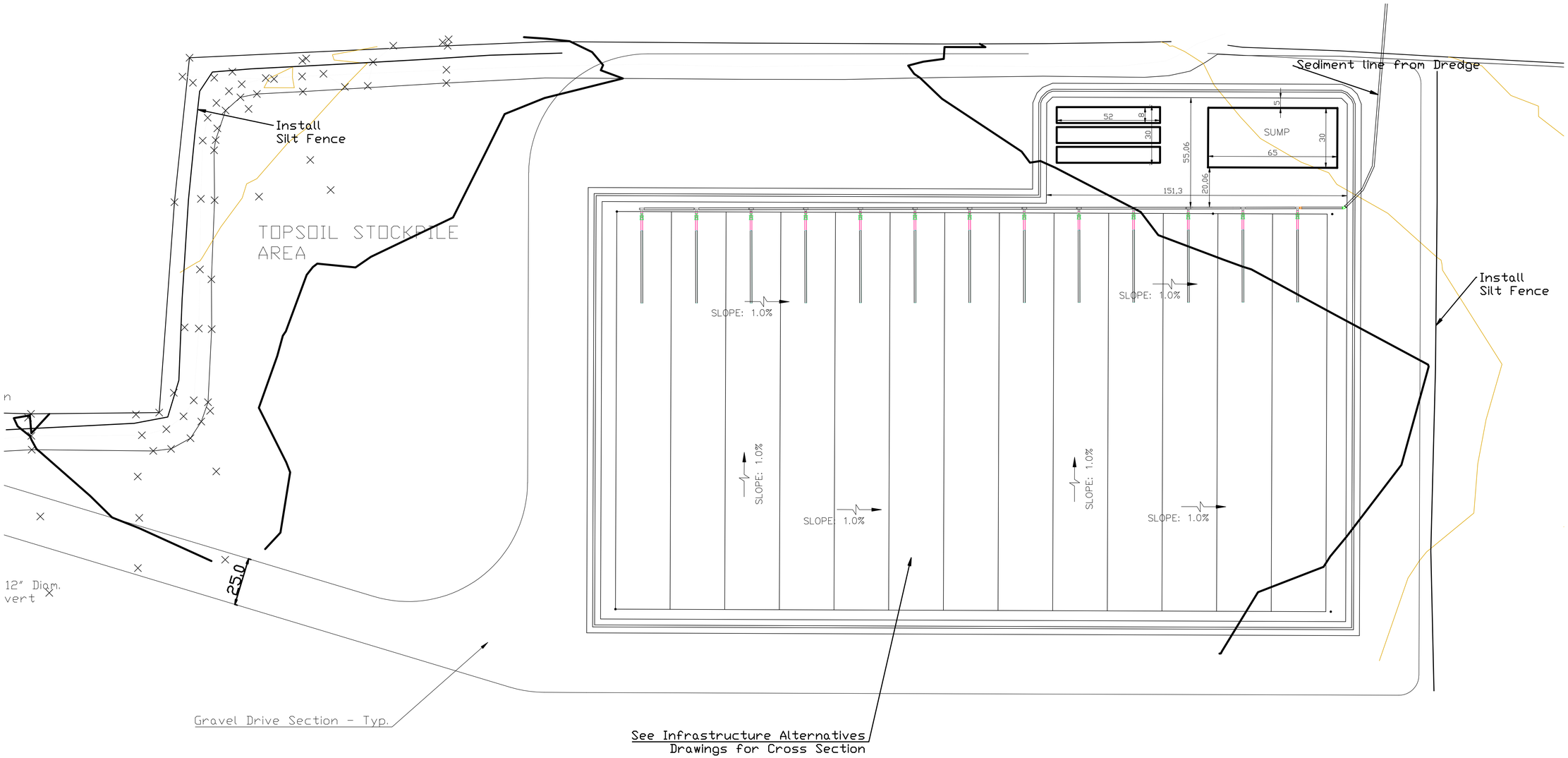
8			

Kalamazoo River

Figure 5 - Geotube Header Pipe Layout

DESIGNED BY AW	DATE 9/10
DRAWN BY AW	DATE 9/10
CHECKED BY	DATE
FILE	EDIT
SCALE 1"=1,000'	
DRAWING 1:1	
PLOT	
PROJECT K-Zoo River	
5 SHEET NO.	



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NO.	REVISIONS	BY	DATE
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4	REVISED IN ACCORDANCE WITH CONSTRUCTION RECORDS		

NO.	REVISIONS	BY	DATE
5			
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8			

Kalamazoo River

PROPOSED LAYDOWN AREA

DESIGNED BY AW	DATE 9/10
DRAWN BY AW	DATE 9/10
CHECKED BY	DATE
FILE	EDIT
SCALE	1"=16'
DRAWING	1:1
PLOT	
PROJECT K-Zoo River	

2

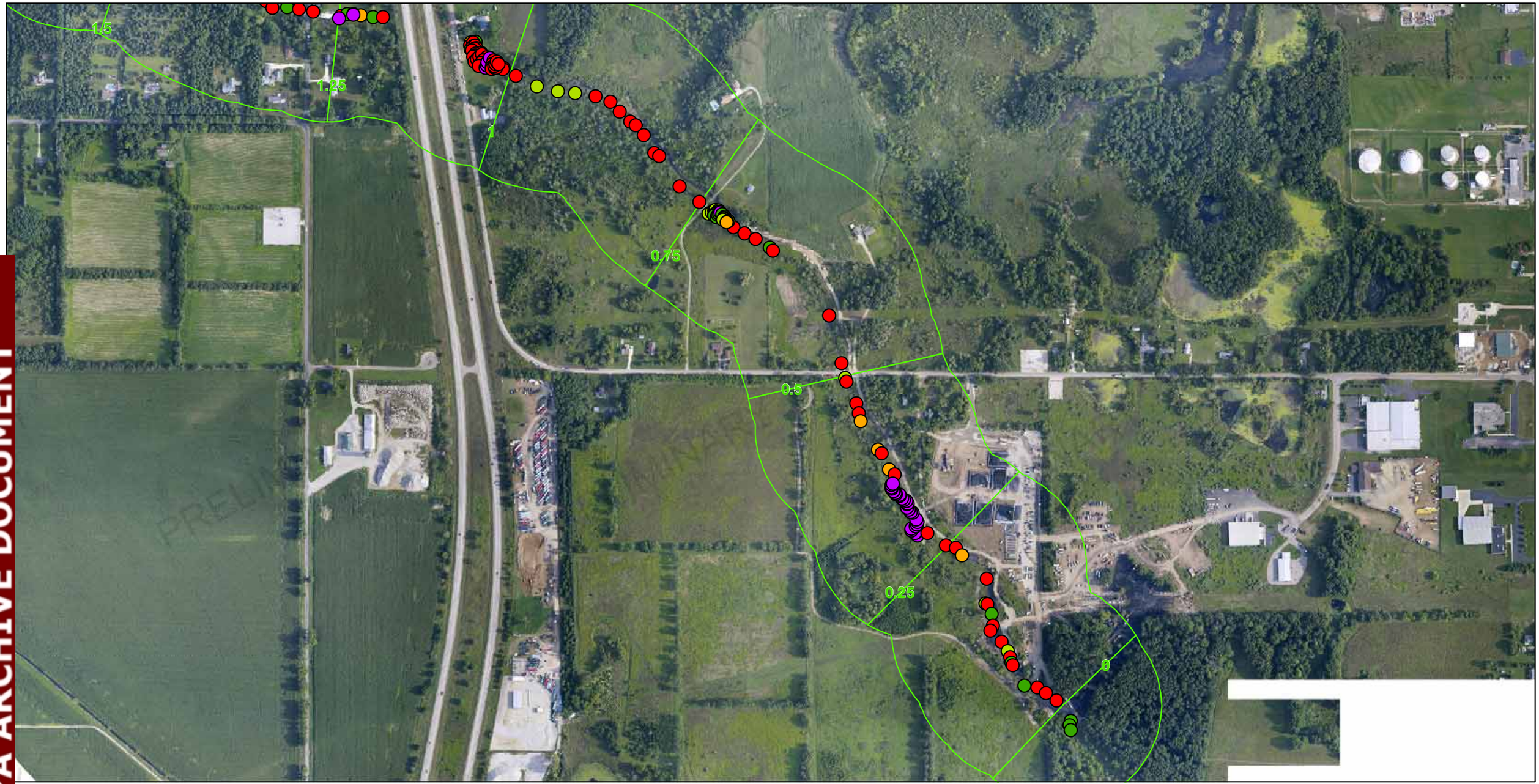
SHEET NO.

APPENDIX A – SITE SUMMARIES

SITE SUMMARY – TALMADGE CREEK

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**Talmadge Creek**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Narrow creek with meandering channel
Approximate Areal Extent:	2 river miles
Approximate Depth of Water:	0.0-0.5 feet
Sediment thickness:	0-1 foot
Bed type:	Soft sediment, sand, and gravel
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	Refer to Technical Memorandum – Final dated September 23, 2010 to U.S. EPA OSC from Weston Solutions, Inc. START
Containment:	A number of various containment structures and systems
Access Issues:	Not accessible via boat
Miscellaneous:	N/A
Recommendations:	ECO: Per Wetland Assessment Report dated August 2010 by URS Corporation, approximately 2.84 acres of Wetland A will be impacted by excavation activities. This wetland was an emergent and forested wetland associated with Talmadge Creek. SOTF: Extensive restoration already undertaken, including excavation and off-site disposal. Recommend that reasonably aggressive steps be taken to remove the submerged oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.



N
W E
S

0 250 500 Feet

1 inch = 500 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

Division Quarter Mile Grid

Poling data through September 25, 2010

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Enbridge Aerial Photography from August 26, 2010

TALMADGE CREEK
MP2-MP1

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 27, 2010

TETRA TECH EC, INC.

9/27/10 -- K. Bellrichard

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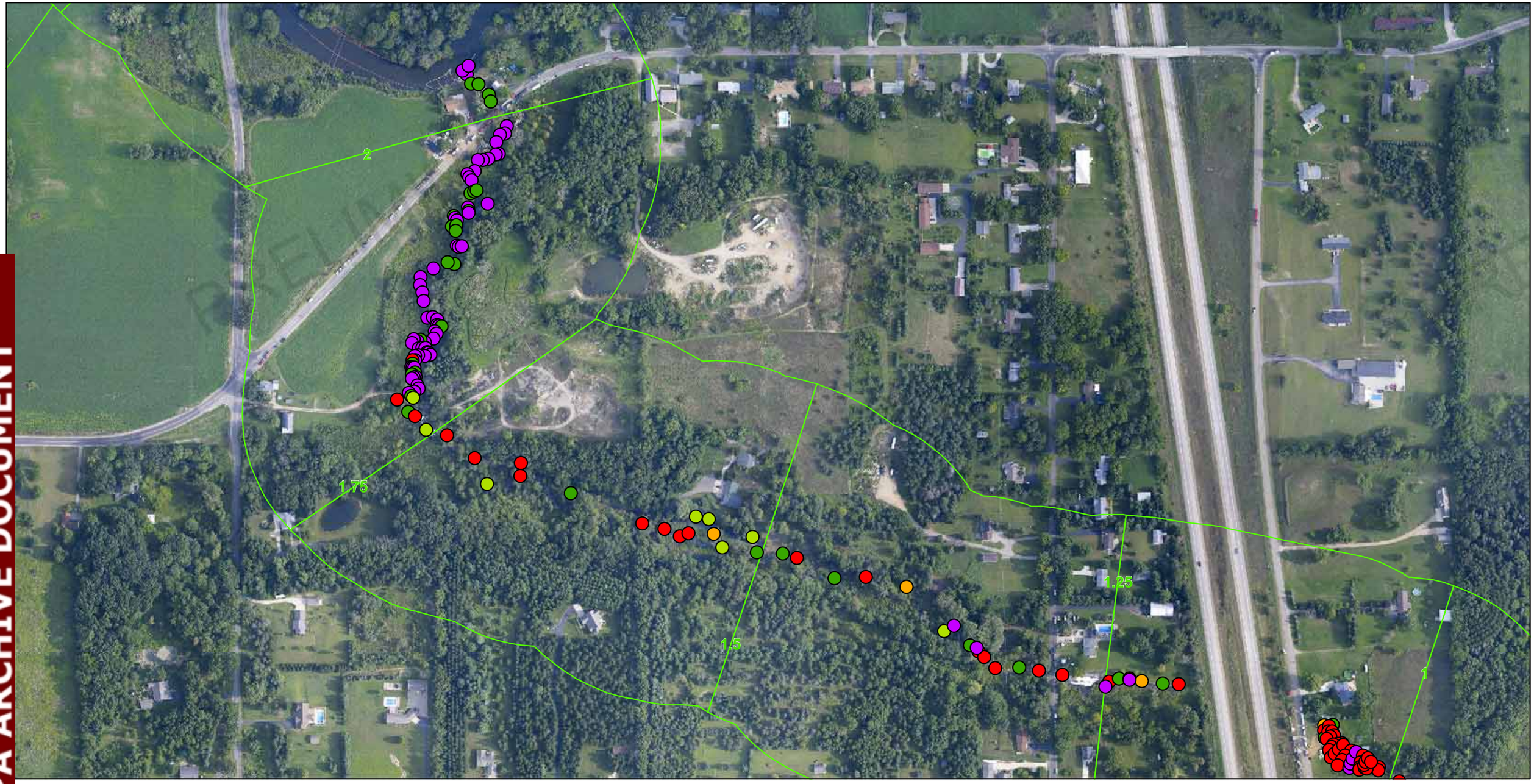

N
W E
S

0 150 300 Feet

1 inch = 300 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

Division Quarter Mile Grid

Poling data through September 25, 2010

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Enbridge Aerial Photography from August 26, 2010

TALMADGE CREEK
MP1-MP2

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 27, 2010

TETRA TECH EC, INC.

9/27/10 -- K. Bellrichard

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SITE SUMMARY – MP 5.55 NORTH

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 5.55 North**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Shallow cove on right bank looking downstream, upstream of Ceresco Dam
Approximate Areal Extent:	~1.5 acres
Approximate Depth of Water:	0 to 1 foot near shore, deeper towards silt curtain
Sediment thickness:	2+ feet
Bed type:	Soft sediment
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	High quality habitat has been impacted. Aquatic beds dominated by *Peltandra* and *Nymphaea* have been cut. Potential fish spawning habitat for grass pickerel, Northern pike and other grass spawners. Turtle habitat and green frog observed. Also habitat for wading birds, shorebirds, rails, waterfowl and muskrat.
Containment:	Silt curtains; details not known
Access Issues:	None
Miscellaneous:	N/A
Recommendations:	ECO: Area has already been impacted by clearing of vegetation. Area may be dredged to address remaining oil, but mitigation will be required by MDNRE as high quality habitat has been impacted. SOTF: Combination of aeration and shoreline dredging

5.75 North

Large amounts of submerged oil (sheen and globules after agitation) but less soft sediment than south side, especially near shore. Buoys dropped during poling to delineate channel-side edge of submerged oil.

5.75 South

Significant soft sediment with large amounts of submerged oil (sheen and globules after agitation). Buoys dropped during poling to delineate channel-side edge of submerged oil.

5.75

5.55 - North

Significant surface sheen made submerged oil more difficult to isolate, but similar setting to opposite side of channel. Buoys dropped during poling to delineate channel-side edge of submerged oil. Upstream extent variable over multiple visits.

5.63 - South Area 37

Significant soft sediment with large amounts of submerged oil (sheen and globules after agitation).

5.5

N
W E
S

0 150 300 Feet

1 inch =150 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
Ceresco Dam

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

9/25/10 -- K. Bellrichard

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SITE SUMMARY – MP 5.63 – SOUTH AREA 37

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 5.63 – South 37**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Shallow cover on left bank looking downstream.
Approximate Areal Extent:	~1 acre
Approximate Depth of Water:	0 to 0.5 feet
Sediment thickness:	2+ feet
Bed type:	Soft sediment
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	High quality habitat has been impacted. Aquatic beds dominated by *Peltandra* and *Nymphaea* have been cut. Remnant vegetation includes *Sparganium*,. Some large (half-dollar sized) snails noted on the bottom. Potential fish spawning habitat for grass pickerel, Northern pike and other grass spawners. Turtle habitat and green frog observed. Also habitat for wading birds, shorebirds, rails, waterfowl and muskrat.
Containment:	500' 18" hard boom, 400' X-Tex
Access Issues:	None
Miscellaneous:	N/A
Recommendations:	ECO: Due to the extent of oil sheen observed in this area, dredging may be unavoidable. MDNRE will require mitigation for disturbance to the marsh, which shows up much larger on areal photos than existing. SOTF: Combination of aeration and shoreline dredging

5.75 North

Large amounts of submerged oil (sheen and globules after agitation) but less soft sediment than south side, especially near shore. Buoys dropped during poling to delineate channel-side edge of submerged oil.

5.75 South

Significant soft sediment with large amounts of submerged oil (sheen and globules after agitation). Buoys dropped during poling to delineate channel-side edge of submerged oil.

5.75

5.55 - North

Significant surface sheen made submerged oil more difficult to isolate, but similar setting to opposite side of channel. Buoys dropped during poling to delineate channel-side edge of submerged oil. Upstream extent variable over multiple visits.

5.63 - South Area 37

Significant soft sediment with large amounts of submerged oil (sheen and globules after agitation).

5.5

N
W E
S

0 150 300 Feet

1 inch =150 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
Ceresco Dam

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

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SITE SUMMARY – 5.75 CERESCO DAM NORTH

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 5.75 Ceresco Dam North**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Shoreline area on right bank looking downstream. An additional area exists at MP 5.5 on the right bank looking downstream. Both areas are upstream of Ceresco Dam.
Approximate Areal Extent:	~1 acre
Approximate Depth of Water:	0.5 to1.5 feet towards shore, deeper near silt curtain
Sediment thickness:	2+ feet, except near shore where soft sediment thins
Bed type:	Soft sediment, sand and gravel near shore
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	High quality habitat has been impacted. Emergent aquatic vegetation beds dominated by *Pontedaria* have been mowed. The area provides juvenile and adult fish feeding habitat for largemouth bass and sunfishes. It also provides waterfowl and wading bird habitat. Second area on the right bank has cut vegetation and water depth of 6 inches. The aquatic bed formerly consisted of water lilies (probably *Nymphaea*), and *Sparganium*. Submerged aquatics such as *Ceratophyllum* and *Potamogeton* are still present.
Containment:	1200’ sediment curtain, 6’ skirt
Access Issues:	None
Miscellaneous:	N/A
Recommendations:	ECO: This area has already been impacted and if dredged would require mitigation. If possible, these and the two areas above should be allowed to regenerate, with dredging limited to the channels and open water areas. SOTF: Combination of aeration and shoreline dredging

5.75 North

Large amounts of submerged oil (sheen and globules after agitation) but less soft sediment than south side, especially near shore. Buoys dropped during poling to delineate channel-side edge of submerged oil.

5.75 South

Significant soft sediment with large amounts of submerged oil (sheen and globules after agitation). Buoys dropped during poling to delineate channel-side edge of submerged oil.

5.75

5.55 - North

Significant surface sheen made submerged oil more difficult to isolate, but similar setting to opposite side of channel. Buoys dropped during poling to delineate channel-side edge of submerged oil. Upstream extent variable over multiple visits.

5.63 - South Area 37

Significant soft sediment with large amounts of submerged oil (sheen and globules after agitation).

5.5

N
W E
S

0 150 300 Feet

1 inch =150 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
Ceresco Dam

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

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SITE SUMMARY – 5.75 CERESCO DAM SOUTH

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 5.75 Ceresco Dam South**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Upstream of Dam
Approximate Areal Extent:	~2.5 acres
Approximate Depth of Water:	0 to 1 foot
Sediment thickness:	4+ feet
Bed type:	Soft sediment
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	Not provided in Ecological Assessment Reports
Containment:	1000’ silt curtain, 6’ skirt
Access Issues:	None
Miscellaneous:	N/A
Recommendations:	ECO: Not provided in Ecological Assessment Reports SOTF: Hydraulic Dredging

5.75 North

Large amounts of submerged oil (sheen and globules after agitation) but less soft sediment than south side, especially near shore. Buoys dropped during poling to delineate channel-side edge of submerged oil.

5.75 South

Significant soft sediment with large amounts of submerged oil (sheen and globules after agitation). Buoys dropped during poling to delineate channel-side edge of submerged oil.

5.75

5.55 - North

Significant surface sheen made submerged oil more difficult to isolate, but similar setting to opposite side of channel. Buoys dropped during poling to delineate channel-side edge of submerged oil. Upstream extent variable over multiple visits.

5.63 - South Area 37

Significant soft sediment with large amounts of submerged oil (sheen and globules after agitation).

5.5

N
W E
S

0 150 300 Feet

1 inch =150 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
Ceresco Dam

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

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SITE SUMMARY – MP 7.75

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 7.75**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Overflow channel on left side of river looking downstream.
Approximate Areal Extent:	0.33 to 0.66 acres
Approximate Depth of Water:	< 1 foot
Sediment thickness:	0.5 to 1.0 foot
Bed type:	Soft sediment over sand and gravel
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	N
Community Description and Habitat Quality:	Channel is 50-60 ft wide at the base with about 15 inches of water over a turbid dark brown substrate that is firmer than most depositional areas. Main channel of the river is shallow (2-6 inches deep) underlain by gravel and cobbles. Coarse woody debris present. This area is habitat for frogs (heard) and a nursery area for young smallmouth, minnows and shiners. Surrounding vegetation is forested on the bank with silver maple (Acer saccharinum), green ash (*Fraxinus pensylvanica*), and basswood (*Tilia americana*).
Containment:	Type unknown
Access Issues:	Difficult due to debris
Miscellaneous:	N/A
Recommendations:	ECO: No major ecological concerns associated with disturbance of the overflow channel. There was little sheen noted during the 14 September 2010 field visit so the area may be cleansing itself. Care should be taken if the site is accessed over land to avoid disturbance to riparian vegetation, wetlands and streambank areas. SOTF: Recommend that reasonably aggressive steps be taken to remove the oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.

7.75

Moderate submerged oil noted by field crews. Sheen only towards backwater channel upstream entrance, with both sheen and globules present further in. Backwater channel extends downstream but access is very difficult.

7.75

N
W E
S

0 100 200 Feet

1 inch =100 feet

Legend

Observed Sheen/Globules After Poling
- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
7.75

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

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SITE SUMMARY – MP 12.50

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 12.50**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Oxbow Channel on right bank facing downstream.
Approximate Areal Extent:	1.75 acres
Approximate Depth of Water:	0.5 to 1.5 feet, slighter deeper in center of channel downstream
Sediment thickness:	0 to 0.5 feet
Bed type:	Silty sand over sand and gravel
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	High quality aquatic habitat. This channel is approximately 120 feet wide at its lower confluence with the mainstem of the river and about 3 feet deep underlain by dark silt. This area provides habitat for juvenile and adult small mouthed bass, minnows and shiners, and there appears to be a mussel bed nearby (a mussel cache was seen on the bank, deposited from a raccoon). Coarse woody debris is present, providing habitat for turtles and frogs. There are thick beds of submerged aquatic vegetation dominated by *Potamogeton* that provide food for waterfowl, herbivorous mammals and cover for fish. A duck blind is present, so it is assumed waterfowl use the area. Rice cutgrass (*Leersia)* grows along the banks. Surrounding palustrine forest is thick mature silver maple.
Containment:	300' of containment boom and X-Tex curtain
Access Issues:	Possible downed trees/vegetation in upper reaches of backwater channel
Miscellaneous:	N/A
Recommendations:	ECO: High quality habitat present. Dredging is not recommended at this location. Care should be taken not to disturb the submerged aquatic vegetation beds dominated by *Potamogeton* or the bank vegetation dominated by *Leersia oryzoides*. SOTF: Less aggressive invasive action at this time. Cautious raking and flushing will be primarily be used, taking care to avoid damage to existing vegetation. Aeration may also be used in a controlled method at specifically targeted areas, taking care to avoid damage to existing vegetation. Recommend that oil containment boom around these areas be reconfigured to allow maximum water flow into and out of these areas and that downstream collection be adequately maintained to capture potential releases.

12.5

Moderate submerged oil noted by field crews, especially near downstream end of priority area. Globules noted after agitation at many locations. Shallow soft sediment over sand.

12.5

N
W E
S

0 100 200 Feet

1 inch =100 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
12.5

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

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SITE SUMMARY – MP 14.75

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 14.75**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Overflow channel, right bank
Approximate Areal Extent:	~ 1 acre
Approximate Depth of Water:	2 to 3 feet
Sediment thickness:	0 to 1 foot
Bed type:	Silty sand over sand and gravel
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	Not provided in Ecological Assessment Reports
Containment:	Type unknown
Access Issues:	Easy
Miscellaneous:	Access via downstream side
Recommendations:	ECO: Not provided in Ecological Assessment Reports SOTF: Recommend that reasonably aggressive steps be taken to remove the oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.

14.75

Moderate submerged oil noted, especially at upstream and downstream end of backwater channel. Signficant surface sheen made determination of submerged oil more difficult in middle section.

N
W E
S

0 100 200 Feet

1 inch =100 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
14.75

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

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SITE SUMMARY – MP 15.25 TO 15.50

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 15.25 to 15.50**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Additional backwater depositional area just south of bridge at 42.3079, 85.188. These two wetlands are part of a single system connected hydraulically by the river and separated only by a bridge.
Approximate Areal Extent:	~3 acres north of Burnham ~9 acres south of Burnham
Approximate Depth of Water:	0 to 1 foot in vegetated areas, 1-2 feet in areas of open water
Sediment thickness:	2+ feet
Bed type:	Soft sediment
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	High quality habitat. This area is essentially a continuation of the wetland described above that is north of the bridge. North of bridge = high quality habitat. Large wetland covered with *Peltrandra, Pontedaria* and lily pads (*Nymphaea*). Open water areas are interspersed and consist of shallow (6 inches on average) water over dark brown silt. These areas collectively provide spawning and nursery habitat for pike, pickerel, sunfish, minnows, shiners, and others. They are used by waterfowl and piscivorous birds such as osprey, kingfishers, and herons, all of which were seen in the field. They are also used by shorebirds and rails. The higher elevation areas along the edge are dominated by reed-canary grass (*Phalaris arundinacea*) and purple loosestrife (*Lythrum salicaria*), both exotic invasives.}
Containment:	Hard boom and X-Tex at entrances to backwater area
Access Issues:	Burnham St. Bridge is too low for standard size airboat
Miscellaneous:	N/A
Recommendations:	ECO: This area is high quality habitat and highly sensitive to disturbance. Dredging should be avoided if possible, particularly within areas of emergent wetland vegetation. The reed-canary grass and purple loosestrife can be cut or removed if necessary, as they are exotics. Removal of these species could also be used for mitigation of impacts elsewhere. Recommend agitation or similar means to remove the oil from these sediments. SOTF: Recommend that non-aggressive remediation steps be taken with other techniques targeted at specific areas. The primary technique employed would rely on less intrusive alternative action such as “deluge” flushing. However, techniques such as aeration, sediment skimming, raking or a combination of these may be used in a controlled method at specifically targeted areas. Strongly recommend that the outlet booms at these locations be removed and downstream collection be adequately

	maintained to capture potential releases.

15.25

15.25

Significant submerged oil observed as both sheen and globules. Poling and staking done to delineate extent. Heavily impacted area includes most of backwater area except northeast corner. Significant sheen on aquatic vegetation.

15

N
W E
S

0 150 300 Feet

1 inch =150 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
15.25

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

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15.5

Significant submerged oil noted by field crews, but less than to the south of Burnham St. bridge. Submerged oil does not extend into the entire backwater area as the riverside levee was not overtopped and there is no large upstream entrance channel.

15.5

N
W E
S

0 100 200 Feet

1 inch =100 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
15.5

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

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SITE SUMMARY – MP 21.50

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 21.50**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Oxbow, open water meander with constriction that makes it depositional
Approximate Areal Extent:	~2.5 acres
Approximate Depth of Water:	0 to 1 foot, slightly deeper in center of channel
Sediment thickness:	0.5 to 1.0 foot
Bed type:	Soft sediment over sand
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	Fairly high quality habitat within the oxbow. Mostly open water area, but margins contain *Peltandra* in some areas. Habitat for both fish and waterbirds.
Containment:	Hard boom at entrances to oxbow, silt fences in oxbow
Access Issues:	Possible trees blocking channel at back of oxbow, may require access from both ends
Miscellaneous:	N/A
Recommendations:	ECO: Impacts to this area could easily be avoided by avoiding disturbance to vegetated areas. SOTF: Less aggressive invasive action at this time. Cautious raking and flushing will be primarily be used, taking care to avoid damage to existing vegetation. Aeration may also be used in a controlled method at specifically targeted areas, taking care to avoid damage to existing vegetation. Recommend that oil containment boom around these areas be reconfigured to allow maximum water flow into and out of these areas and that downstream collection be adequately maintained to capture potential releases.

21.5

Significant submerged oil observed as sheen and/or globules after agitation. Largely in soft sediment edges of oxbow channel, with less in deeper areas where flow is faster and bed is sand. Sheen noted on aquatic vegetation.

21.5

21.25

N
W E
S

0 100 200 Feet

1 inch =100 feet

Legend

Observed Sheen/Globules After Poling
- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
21.5

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

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SITE SUMMARY – MP 26.00

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 26.00**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Backwater pool on right side of river facing downstream.
Approximate Areal Extent:	~ 1 acre
Approximate Depth of Water:	< 2 feet
Sediment thickness:	1 to 1.5 feet
Bed type:	Soft sediment
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	Shallow backwater inlet about an acre in extent, surrounded by palustrine forest on two sides, and a residence on the third. A portion is mudflat. Water depth is 6 inches or less, overlying dark organic silt. Sparse vegetation; mostly purple loosestrife where any is present. Some refuge habitat for juvenile fish, but looks like anoxic conditions. Drift line of wood and trash created by owner. Some wood frog habitat toward the head of the inlet.
Containment:	400' 18" hard boom, 400' X-Tex
Access Issues:	Easy access
Miscellaneous:	N/A
Recommendations:	ECO: No major environmental concerns. This site could benefit from restoration/enhancement. Candidate mitigation site. SOTF: Recommend that reasonably aggressive steps be taken to remove the oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.

26.0

Significant submerged oil noted field crews and EPA. Submerged area will fluctuate with changing water levels. Land side mapped boundary is approximate. At higher water levels, impact area may extend further inland.

26.25

Significant surface sheen and submerged oil noted by field crews and EPA. Land side extent is approximate and will vary with fluctuations in water level.

26

26.25

N
W E
S

0 150 300 Feet

1 inch =150 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
26.0 and 26.25

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

9/25/10 -- K. Bellrichard

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SITE SUMMARY – MP 26.25

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 26.25**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Small cove on the right side of the bank looking downstream.
Approximate Areal Extent:	~ 1 acre
Approximate Depth of Water:	< 1 foot
Sediment thickness:	1 foot
Bed type:	Soft sediment
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	N
Lab analysis (Y/N)	N
Community Description and Habitat Quality:	Shallow cove about 0.75 acres in extent. Some sharp-stemmed bulrush on one side, but most is open water about 12 inches deep over silt. Coarse woody debris present. Narrow shoreline mudflat with spotted sandpiper foraging on it. Mudflat in the middle about 50x100 ft in extent. Refuge habitat for juvenile fish; hundreds of small fish about a half inch in size. Some concrete on shoreline. Riparian forest surrounds on three sides.
Containment:	300' 18" hard boom, 300' X-Tex curtain
Access Issues:	Easy to moderate
Miscellaneous:	N/A
Recommendations:	ECO: Not a major environmental concern. Future oil extraction efforts should keep the area shallow. Potential candidate mitigation site for enhancement. SOTF: Recommend that reasonably aggressive steps be taken to remove the oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.

26.0

Significant submerged oil noted field crews and EPA. Submerged area will fluctuate with changing water levels. Land side mapped boundary is approximate. At higher water levels, impact area may extend further inland.

26.25

Significant surface sheen and submerged oil noted by field crews and EPA. Land side extent is approximate and will vary with fluctuations in water level.

26

26.25

N
W E
S

0 150 300 Feet

1 inch =150 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
26.0 and 26.25

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

9/25/10 -- K. Bellrichard

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SITE SUMMARY – MP 26.65

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 26.65**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Cove area on the right side, outside of the curve, looking downstream.
Approximate Areal Extent:	0.5 acres
Approximate Depth of Water:	0.5 feet
Sediment thickness:	1.5 feet
Bed type:	Soft sediment
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	N
Community Description and Habitat Quality:	Cove area surrounded by palustrine forest wetland on two sides and residences on another. This area is mostly a mudflat, with a small amount of open water on the river side abutting the existing boom. Water depth is 0-6 inches. Twenty-foot wide margin of emergent vegetation (*Peltandra, Pontedaria, Sagittaria*), with some purple loosestrife on mudflat on the river side. Nearby wet meadow located above the bank has high floristic diversity. Not much fish habitat under normal flow conditions.
Containment:	400' 18" hard boom, 350' X-Tex
Access Issues:	Easy
Miscellaneous:	Heavy vegetation
Recommendations:	ECO: Environmental concerns limited to the narrow margin of emergent vegetation, which should be avoided during submerged oil clean-up activities. Nearby wet meadow should be avoided if this area is accessed via over land. SOTF: Recommend that reasonably aggressive steps be taken to remove the oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.

N
W E
S

0 100 200 Feet

1 inch =100 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
26.65

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

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SITE SUMMARY – MP 27.90

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 27.90**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Meander with depositional bar; mudflat area on right side looking downstream N42 20.467 W85 20.156
Approximate Areal Extent:	0.75 acres
Approximate Depth of Water:	0.5 feet
Sediment thickness:	0 to 1 feet
Bed type:	Soft sediment
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	N
Lab analysis (Y/N)	N
Community Description and Habitat Quality:	Unvegetated mudflat; narrow scattered fringe of willows abruptly transitioning to palustrine forest dominated by mature silver maple. Fish noted in margins along the river's edge (juvenile largemouth bass and minnows).
Containment:	200' hard boom, 200' X-Tex
Access Issues:	Easy
Miscellaneous:	N/A
Recommendations:	ECO: No major environmental concerns. This area receives continual deposition of sediments, so spot dredging would be acceptable if required. SOTF: Recommend that reasonably aggressive steps be taken to remove the oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.

N
W E
S

0 100 200 Feet

1 inch =100 feet

Legend

Observed Sheen/Globules After Poling
- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
27.9

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

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SITE SUMMARY – MP 28.25

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 28.25**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Oxbow; deep channel with depositional area adjacent 42.20361, 85.20159 to 42.20282 to 85.20237
Approximate Areal Extent:	1.5 acres
Approximate Depth of Water:	< 1 foot
Sediment thickness:	Up to 2 feet
Bed type:	Soft sediment over sand
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	N
Community Description and Habitat Quality:	The channel is inundated over about half its area, and the remainder is dark brown mudflat. Areas that are inundated are currently stagnant with little flow. Some nursery and potential refuge habitat for fish. Also habitat for frogs and reptiles, but none seen. Adjacent palustrine forest is a high quality habitat that contains depressions. One is dominated by *Peltandra*, and the other is a wet meadow with high floristic diversity, including several rare or high quality native species (lizard-tail, false dragon's head, Sium suave and others).
Containment:	400' hard boom and X-Tex at south entrance, 200' each at north
Access Issues:	Difficult
Miscellaneous:	Heavy debris and oxbow
Recommendations:	ECO: No major environmental concerns associated with the oxbow channel itself – any impacts from dredging could be mitigated. Avoid disturbance to adjacent high quality palustrine forest and low areas within it. SOTF: Recommend that reasonably aggressive steps be taken to remove the oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.

28

28.25

Significant submerged oil, especially in the form of sheen after agitation. Some globules noted. Over 1 ft of soft sediment.

28.25

N
W E
S

0 100 200 Feet

1 inch =100 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

Priority Areas

Priority Area Approximate Containment (if known)

Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
28.25

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

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SITE SUMMARY – MP 33.00 A (NORTH) AND MP 33.00 B (SOUTH)*
*Designation A and B used by Field Teams. Not indicated on Priority List.

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 33.00 A (NORTH)**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Backwater area on right side looking downstream; two depositional coves 42.29678, 85.3868
Approximate Areal Extent:	0.25 to 0.50 acres
Approximate Depth of Water:	< 1 foot
Sediment thickness:	0.5 to 1.0 foot
Bed type:	Soft sediment over sand
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	N
Community Description and Habitat Quality:	Cove with stagnant open water 6-12 inches deep. Some dead branches in the water. Area is surrounded by palustrine forest. Juvenile fish nursery habitat and refuge habitat, although none seen here. Amphibian habitat along the edge. A significant 20-acre cattail marsh extends to the east.
Containment:	500' hard boom, 500' X-Tex
Access Issues:	Easy
Miscellaneous:	N/A
Recommendations:	ECO: No major environmental concerns. Aeration or some sediment removal would be acceptable, but the shallow depth should be maintained. SOTF: Recommend that reasonably aggressive steps be taken to remove the oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.

33.0
Moderate submerged oil noted, including globules.
Backwater extent is approximate and will vary based on water levels.

33

33.0
Significant submerged oil noted.
Extends up small backwater channel.

33.25

N
W E
S

0 150 300 Feet

1 inch =150 feet

Legend

Observed Sheen/Globules After Poling
- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
33.0

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

9/25/10 -- K. Bellrichard

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Site SUMMARY – MP 33.00 A (North) and MP 33.00 B (SOUTH)* (Continued)

Site Location:	**MP 33.00 B (SOUTH)**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Backwater channel
Approximate Areal Extent:	0.33 acres
Approximate Depth of Water:	1 foot
Sediment thickness:	0.5 to 1.5 feet
Bed type:	Soft sediment over sand
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	N
Community Description and Habitat Quality:	Cove with stagnant open water 6-12 inches deep. Some dead branches in the water. Area is surrounded by palustrine forest. Juvenile fish nursery habitat and refuge habitat, although none seen here. Amphibian habitat along the edge. A significant 20-acre cattail marsh extends to the east.
Containment:	400' hard boom, 400' X-Tex
Access Issues:	Moderate
Miscellaneous:	N/A
Recommendations:	ECO: No major environmental concerns. Aeration or some sediment removal would be acceptable, but the shallow depth should be maintained. SOTF: Recommend that reasonably aggressive steps be taken to remove the oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.

33.0
Moderate submerged oil noted, including globules.
Backwater extent is approximate and will vary based on water levels.

33

33.0
Significant submerged oil noted.
Extends up small backwater channel.

33.25

N
W E
S

0 150 300 Feet

1 inch =150 feet

Legend

Observed Sheen/Globules After Poling
- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
33.0

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

9/25/10 -- K. Bellrichard

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SITE SUMMARY – MP 33.25

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 33.25**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Backwater channel on the right side looking downstream, with island.
Approximate Areal Extent:	0.75 acres
Approximate Depth of Water:	Unknown
Sediment thickness:	0.5 to 1.5 feet
Bed type:	Soft Sediment over sand
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	N
Lab analysis (Y/N)	N
Community Description and Habitat Quality:	Backwater channel is open water and shallow, with no vegetation, overlying silty bottom. Tiny juvenile fish observed. Surrounded by palustrine forest dominated by silver maple.
Containment:	500' total hard boom, 500' total X-Tex
Access Issues:	Easy to moderate
Miscellaneous:	N/A
Recommendations:	ECO: No major environmental concerns. Could stand disturbance to the channel itself, similar to other shallow coves on the river. SOTF: Recommend that reasonably aggressive steps be taken to remove the oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.

N
W E
S

0 100 200 Feet

1 inch =100 feet

Legend

Observed Sheen/Globules After Poling

- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

- Priority Areas
- Priority Area Approximate Containment (if known)
- Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
33.25

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

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SITE SUMMARY – MP 36.25

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 36.25**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Cut-off meander
Approximate Areal Extent:	~ 1.33 acres
Approximate Depth of Water:	1 – 3 feet
Sediment thickness:	0.5 – 1.5 feet
Bed type:	Soft sediment over sand
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	
Containment:	
Access Issues:	Trees block channel where it narrows
Miscellaneous:	Wetlands on island have submerged oil but are no longer connected to river.
Recommendations:	ECO: This channel will have to be dealt with carefully to avoid impacts to aquatic plants and animals. Dredging should be avoided and any re-suspension activities should avoid impacting the submerged aquatic vegetation beds and be cordoned off with a silt curtain that will minimize impacts to fish. SOTF: Less aggressive invasive action at this time. Cautious raking and/or flushing, taking care to avoid damage to existing vegetation. Recommend that oil containment boom around these areas be reconfigured to allow maximum water flow into and out of these areas and that downstream collection be adequately maintained to capture potential releases.

36.25

Moderate submerged oil noted including sheen and globules after agitation. Higher impact on upstream side of backwater channel. Some oil present in wetland/marsh areas on adjacent no longer connected to river.

N
W E
S

0 100 200 Feet

1 inch =100 feet

Legend

Observed Sheen/Globules After Poling
- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

Priority Areas

Priority Area Approximate Containment (if known)

Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
36.25

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

TETRA TECH EC, INC.

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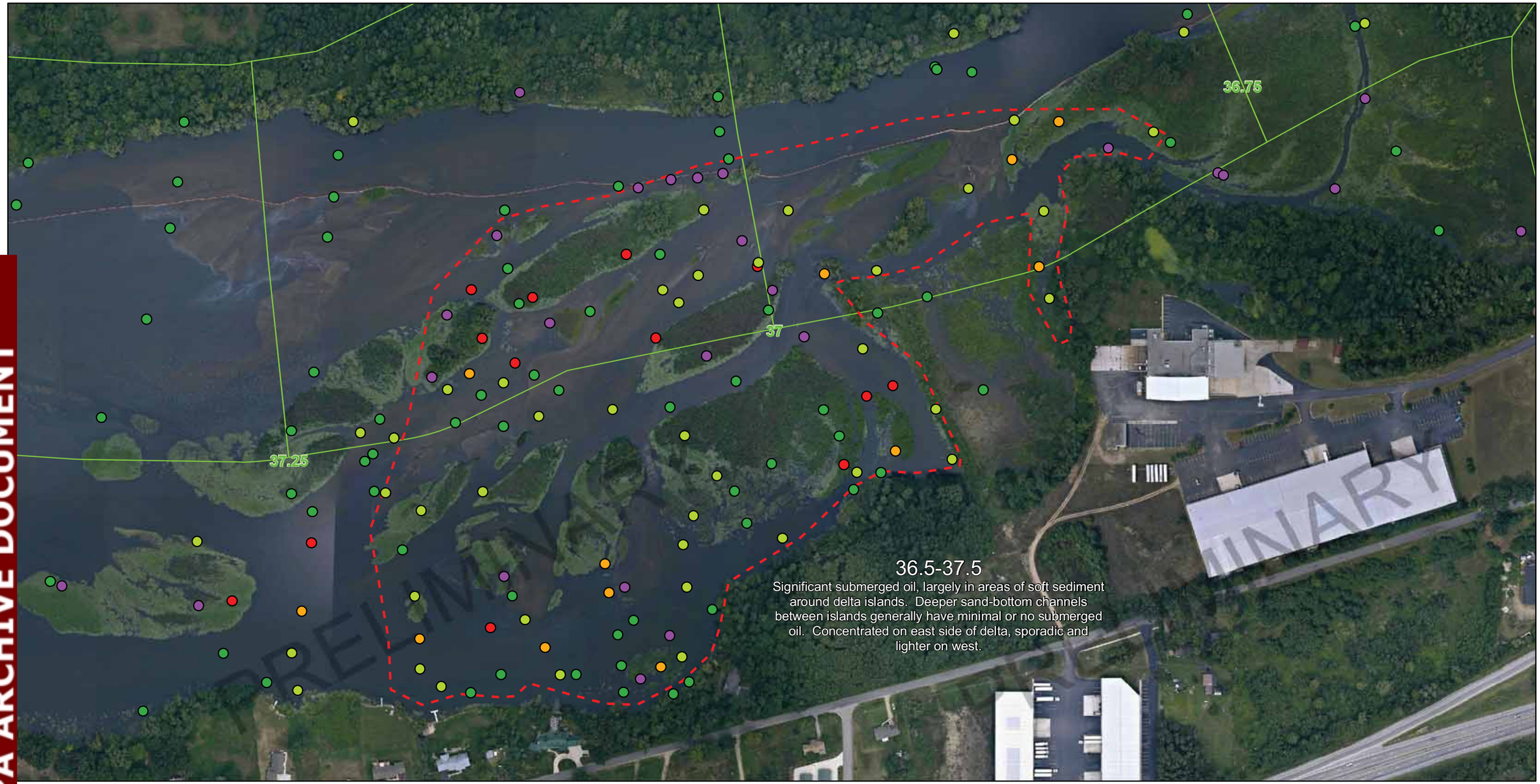
SITE SUMMARY – MP 36.50 TO 37.50 (MORROW LAKE DELTA)

The information provided below shall be used by the field teams to better understand site specific characteristics of the priority locations and determine the most appropriate recovery technology.

Site Location:	**MP 36.50 to 37.50 (Morrow Lake Delta)**
Site Layout:	See Figure Attached
Description and Geomorphic Setting:	Delta area on northern end of Morrow Lake, with several islands.
Approximate Areal Extent:	~40 acres
Approximate Depth of Water:	0 to 1 foot. Slightly deeper in channels between vegetated islands
Sediment thickness:	0 to 1 foot
Bed type:	Soft sediment over sand
Data Collected:	
Poling (Y/N)	Y
Cores (Y/N)	Y
Lab analysis (Y/N)	Y
Community Description and Habitat Quality:	High quality habitat. The islands themselves are dominated by purple loosestrife so they have limited wildlife habitat value. The islands do provide cover for fish, however, that hang along their edge. The deeper water (2 to 3 feet deep) provides excellent habitat for adult fish.
Containment:	Unknown
Access Issues:	None
Miscellaneous:	Morrow Lake Delta
Recommendations:	DCO: The purple loosestrife islands can be impacted if necessary but efforts should be maintained to retain the root mass as an anchor for sediment. Impacts to the channel itself should be avoided if possible. If dredging is required mitigation may be required for the open water habitat. SOTF: Recommend that reasonably aggressive steps be taken to remove the oil. The technique employed would rely primarily on aeration, but may also include sediment skimming, flushing, raking or a combination of these.



N
W E
S

0 250 500 Feet

1 inch =250 feet

Legend

Observed Sheen/Globules After Poling
- None Observed
- Slight
- Moderate
- Heavy
- Observed But Quantity Not Noted

Priority Areas

Priority Area Approximate Containment (if known)

Division Quarter Mile Grid

Coordinate System: Michigan State Plane South
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: International Feet
Aerial Photography from August 26, 2010

PRIORITY AREAS
Morrow Lake Delta

SUBMERGED OIL TASK FORCE
KALAMAZOO AND CALHOUN COUNTIES
MICHIGAN

Sep 25, 2010

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APPENDIX B – STANDAND OPERATING PROCEDURE

STANDARD OPERATING PROCEDURE
For
Submerged Oil Recovery
Enbridge Line 6B Pipeline Release

APPROVED: _____
(Name/Title)
DATE: _____

September 29, 2010
Rev. #7

TABLE OF CONTENTS

Submerged Oil Recovery SOP

Operations

1. Scope and Application

The purpose of the Submerged Oil Recovery Standard Operating Procedure (SOP) is to provide general guidance to the recovery operations of submerged oil resulting from the Enbridge Line 6B pipeline release in Marshall, Michigan. **This SOP addresses submerged oil recovery operations for the sites approved for treatment by the EPA.**

2. Prioritization of Sites for Submerged Oil Recovery

2.1. The scheduling of the sites for submerged oil recovery using sediment aeration will be prepared by Enbridge and the EPA.
2.2. Wildlife Management must clear the areas prior to starting work.

3. Site Preparation

3.1. Confirm the integrity of the hard containment and X-Tex or GeoTextile boom already in place.
3.2. Deploy sorbent boom along the entire shore side perimeter of the work area and any vegetation area to prevent contamination. This procedure can only be applied to the sites identified by the EPA and Enbridge.
3.3. Confirm that water depth is within operating guidelines for aeration (Section 5.0). The aeration unit with the modified diffuser panel can operate in a water depth range from a maximum 4 ft. to a minimum water depth of 8 inches.
3.4. If the water depth is less than the required 8 inches, a secondary method for oil recovery will be used (Section 6.0). If the water depth is greater than 4 ft., ensure the availability of long handled raking tools or chain drags to stir up the bottom sediment.
3.5. Grid the water area into 50 ft. linear runs from the shoreline to containment boom—to be dissected if runs are wider than 75 ft. Optimal area of the grid is 40ft. x 75ft.
3.6. On completion of each phase of work, the grid shall be staked with a green/red flagging tape marked with location, grid number and date. The green flags designate a successfully treated cell and the red flags designate cells requiring further treatment.
3.7. Do not park vehicles or equipment near a wetland.
3.8. Minimize foot traffic through wetland areas to minimize damage to native vegetation and soils.

4. Equipment & Manpower

4.1. Pond aeration unit with electric motor (explosion proof) with aluminum impeller.
- Diffuser panel is required at water depths less than 4 ft.
- Flotation Device 2.5ft (wide) by 4 ft. (long)

4.2. One airboat outfitted with a platform deck. Crew of 4, HAZMAT trained.

4.3. 2-3 Jon boats. Crew of 2/boat, HAZMAT trained. (3 boats are recommended in areas where the water current is strong, windy conditions, heavy undergrowth or shore side vegetation etc.)
4.4. Generator and electrical cords (max. cord length 40ft.)
4.5. Rope (3-4 sections of 40 ft. lengths max. each)
4.6. Sorbent boom to cover the shoreline perimeter of the work area.
4.7. Sorbent pads, mops, bucket etc. Quantities and types are dependent on the amount of oil and size of the remediation site.
4.8. Water skimming equipment may be required depending on the amount and condition of the oil released after the aeration. This equipment can remain at the main equipment staging area until it required.
4.9. Two or three hand held "leaf blowers"—gasoline powered.
4.10. Low pressure water hoses equipped with diffuser nozzles.
4.11. Two or three rakes.
4.12. Centrifugal pump with generator.

5. Aeration of the Submerged Sediments

5.1. **The US EPA has established a maximum soil impact depth of 6 inches for submerged sediment aeration for Enbridge Line 6B pipeline release.** This is controlled by the angle of the shaft (30 degrees) and the addition of the diffuser panel. **A diffuser is required at water depths of less than 4 ft.**
5.2. Ensure the integrity of both the hard and sorbent booms and X-Tex or GeoTextile curtain before starting work. Minimize boat traffic across the hard boom to avoid releasing product from the containment area.
5.3. At the discretion of the EPA/Enbridge team lead, additional sorbent boom may be added on the inside edge of the hard boom in the containment area.
5.4. Launch the self-propelled aeration unit from the bow of the boat.
5.5. Using the control ropes to guide the self-propelled aeration unit, move the unit to the first grid section to be treated. Start at the farthest point upstream from the air boat first and work back toward the boat.
5.6. Using the control ropes to guide the aerator, sweep the unit side to side approximately 10 ft. right and left of center. There will be a minimum of two passes per cell, one pass is defined as first an upstream sweep followed by a downstream sweep.
5.7. If there is no discernable oil on the surface, flag the cell as completed with a green flag and move to the next grid location and repeat the sweeping procedure.
5.8. Continue the process until the entire area has been "swept".
5.9. If discernable oil is present after the second pass, recover the oil and proceed with a third pass.
5.10. If discernable is present after a third pass, additional sweeps can be conducted at the discretion of the team lead.

6. Secondary Methods for Oil Recovery (for red flag areas)

6.1. When the above aeration procedure cannot be used due to insufficient water depth, the areas will be manually water flushed, raked or a combination of both.
6.2. The EPA/Enbridge Team Lead will determine the appropriate secondary treatment technique to be used at each red flag cell.

6.3. *Flushing*:

- In areas identified by the Team Lead/EPA to be flushed, a high volume/low pressure water flush will be used.
- Utilizing the same grid pattern as installed for the aeration, systematically flush the red cell with water in a sweeping motion.
- Runoff from the flushing should be directed toward the collection area and sorbent boom lining the work area.
- This process should be repeated until there is no discernable oil visible released from the cell.
- Flag the cell as green.

6.4. *Raking*:

- In areas identified by the Team Lead/EPA to be flushed, use a hand held rake to gently agitate the bottom sediment to release submerged oil.
- Allow the released oil to surface.
- Direct any floating oil to the collection area and sorbent boom lining the work area.
- This process should be repeated until there is no discernable oil visible released from the cell.
- Flag the cell as green.

7. Recovery of Floating Oil

7.1. Using the Jon boats and hand held "leaf blowers", direct the floating oil to one corner of the boomed work area. Select an area that has the lowest ecological complexity (if possible), and that is easily accessible as the oil collection area.

7.2. Using absorbent pads, mops etc. to collect and remove the recovered oil. In extremely contaminated areas, a skimmer may be required. Refer to Oil Recovery and Containment Plan for appropriate oil recovery procedures.

8. Decommissioning of Equipment and Waste Disposal

8.1. Oiled debris including the sorbent booms, pads, and other material used to collect the recovered oil will be disposed of in accordance with the Waste Treatment, Transportation and Disposal Plan.

8.2. The aluminum shaft and mechanical parts of the aeration unit should not be contaminated with oil as it operates below the surface. The unit can be rinsed off with fresh water and air dried at the equipment staging area.

8.3. The buoyancy control device is likely to be covered by a film of oil as it sits on the surface of the water. This device should be transported to the decontamination area and cleaned according to procedures.

8.4. The sorbent boom should be removed from the site if it has become saturated with oil or when it has been determined that no further aeration is required by the appropriate authorities. It should be disposed of according to oily waste disposal procedures.

8.5. The hard and sorbent boom should remain in place until the site has been designated as "clean" by the appropriate authorities.

9. Site Inspection and Final EPA Sign-Off

9.1. The Submerged Oil Team Lead, with agreement of the team EPA and Enbridge representatives, is responsible for identifying when a site is ready for the final inspection by the EPA.

9.2. Oil recovery activity at the identified site will be stopped for a forty eight (48) hour "wait" period. All hard and sorbent booms should remain in place during this period.

9.3. This information (i.e., recommended for final inspection/date) will be reported to the Submerged Oil Task Force (SOTF) as part of the daily briefing.

9.4. The Team Lead may observe the site conditions during this "wait" period.

9.5. After the 48 hr. "wait" period, an EPA and Enbridge representative will visually inspect the site recommended for final inspection.

9.6. Consistent with the Data Quality Objectives (DQO) for the project, the final inspection will be a qualitative assessment based on visual inspection for the presence of materials capable of producing a release of oil or sheen to navigable water.

9.7. The visual inspection and completion sign-off will follow the SOP for Remediation Completion for the Enbridge Oil Spill at Talmadge Creek Marshall, Michigan (see Attachment 1).

9.8. Residual contamination related to the release will be addressed as part of the long-term assessment and remediation efforts for the site using quantitative methods.

10. Safety Considerations

10.1. The site safety plan should identify the specific safety equipment required for that work site.

10.2. Safety goggles, hearing protection and sturdy work gloves are required for the workers on the air boat. Workers that will be operating the aeration unit and should not come into direct contact with free oil. All boats with aeration systems must have four gas monitors for continuous monitoring.

10.3. Workers on the Jon boats will be involved in recovering the floating oil so they are required to wear the appropriate PPE including coveralls, hearing protection (when working with the leaf blowers), gloves and eye protection.

10.4. Any worker assisting with the decommissioning and disposal of the sorbent boom and other oily waste/materials will require the appropriate PPE including coveralls, gloves and eye protection.

10.5. Appropriate personal flotation protection is required for all personnel working on the boats and near the water's edge.

ALL OPERATIONS AND TARGETS DESCRIBED IN THIS STANDARD OPERATING PROCEDURE (SOP) ARE SUBJECT TO CHANGE BASED ON THE FIELD OBSERVATIONS AND JUDGEMENT OF THE EPA AND THE ENBRIDGE FIELD SUPERVISOR.

ATTACHMENT 1

Submerged Oil Recovery Group
Downstream Impacted Areas
Standard Operating Procedures (SOPs) for Remediation Completion
For the
Enbridge Oil Spill at Talmadge Creek
Marshall, Michigan

PURPOSE

Purpose of this SOP is to provide the protocols and procedures for United States Environmental Protection Agency (U.S. EPA) and Enbridge Energy (Enbridge) representatives to qualitatively determine that recoverable oil in the Talmadge Creek, the Kalamazoo River and their sediments have been removed from these navigable waterways at the Enbridge Line 6B MP 608 Pipeline Release Project, Marshall, Michigan.

BACKGROUND

The Data Quality Objectives (DQOs) defined in Enbridge's Sampling and Analysis Plan (SAP) include both qualitative and quantitative descriptions for endpoint determinations as they relate to visual field screening for the presence of materials capable of producing a release of oil or sheen to navigable water. This priority site closure SOP does not address non-recoverable or residual contamination related to the release.

Remediation techniques, primary (aeration/diffusion) and secondary (flushing and raking), have been implemented to liberate entrained oil from the sediment for recovery. Implementation of the remedial activities required that each Priority Site was divided into treatment cells. Following completion of remediation in each cell, defined by a grid of sorbent and containment booms, the areas will be staked with a green flag, labeled with a cell number and date. The Enbridge Submerged Oil Task Force Leader, with agreement from the on-site U.S. EPA and Enbridge representatives, is responsible for identifying when a Priority Site is ready for the final inspection by the Submerged Oil Task Force Leaders from U.S. EPA and Enbridge. The notification (recommendation for final inspection/date) will be reported to the Submerged Oil Task Force as part of the daily briefing. Following notification, remediation techniques and oil recovery activity at the identified Priority Site will be stopped for a 48 hour "wait" period prior to final inspection. All containment booms and sorbent booms will remain in place during this period.

PROCEDURES

Following the 48 hour wait period, the Submerged Oil Task Force Leaders from U.S. EPA and Enbridge will visually inspect the Priority Sites recommended for final inspection. Consistent with the DQOs for the project, the final inspection will be a qualitative assessment based on visual inspection for the presence of materials capable of producing a release of oil or sheen to navigable water. Residual contamination related to the release will be addressed as part of the long-term assessment and remediation efforts for the Site using quantitative methods.

Visual inspection of the Priority Sites will include the following:

- A "Submerged Oil Status Tracking Form" and a map of the Priority Site illustrating the delineated cells that will require inspection, will be provided to each team;
- A visual inspection of each Priority Site will be conducted by the team. Inspections will include an evaluation of sorbent booms and containment booms as well as observations related to the presence of oil on the surface water within the Priority Site. Visual inspection of the water within each Priority Site cell will be done as each cell is agitated at regular intervals across the cell in a random pattern using a rod or rake. Depending on the site, agitation may be accomplished more simply by maneuvering the air boat around each cell. The sediment will be agitated to the extent that the water becomes turbid and sediment is visibly suspended and seen in the water. Due to the various water depth at each cell it is anticipated that the inspection methods will vary from site to site, and potentially from cell to cell to achieve the criteria required for through inspection.
- Visual observation will note the presence of oil globules and tar flecks and similar discernible submerged oil characteristics during the agitation process. The observations will specify whether the materials are of sufficient quantity and produced at a frequency that would be considered recoverable using the methods identified in Enbridge's SOP. All observations will be documented.
- Based on qualitative results and the experience of the Submerged Oil Task Force Leaders in mitigation of oil discharges, the remedial activities at the Priority Sites will be determined to be complete if the site inspection results in the determination that no recoverable oil remains. If the inspection reveals that recoverable oil is still present, this will be noted on during the inspection and Enbridge will return the site to perform additional remediation.
- Once a site is cleared, the Submerged Oil Remediation Status Tracking form will be signed and dated accordingly. In this event the area will be cleared as completed to the satisfaction of the U.S. EPA. The tracking form will be attached to a report documenting work in this area in a format similar to the segment reports submitted for the surface oil segments.

APPENDIX C – ACTIVITY HAZARD ANALYSIS

ACTIVITY HAZARD ANALYSIS (AHA)
Submerged Sediment Aeration and Oil Recovery
(Tasks as contained in the SOP (Rev. 4)

Analyzed by/Date: Jennifer Fadden, Tetra Tech EC, Inc. 9/21/10

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
1. Check for hazardous weather outlook	Hazardous weather such as wind or thunderstorms, extreme cold or hot weather present multiple hazards to boaters	Attend morning safety meetings and obtain safe work permit. Check NOAA weather forecast for potential severe weather warnings. Ensure there is a way to receive hazardous weather alerts in a timely manner to allow boats and personnel to seek shelter and stand down prior to the onset of severe weather. Follow the 30-30 rule if lightning is observed in accordance with the HASP. Dress or have sufficient clothing for encountering a wide array of weather conditions, including severe weather and weather that may present cold or heat stress conditions. Follow thermal stress procedures in the HASP.
2. Drive vehicle to site.	Vehicle could hit someone or something or be hit.	Follow traffic rules and regulations within and around project site, including high visibility vest. Wear seatbelts in all vehicles at all times. Drive defensively and be aware of personnel and truck/heavy equipment operating in the area.
3. Inspect airboat and Jon boats	Improper inspection of boats could cause workers to be exposed to hazards associated with operating boats and working on water.	Ensure that a competent person (boat operator) inspects vessel and all associated equipment and that boat is in safe operating condition. Inspect boat, including emergency equipment, before use and at start of each shift. Verify that boat motors are equipped with kill switch, and location of switch is known by all site workers. All workers must receive training as required by USCG. Ensure there is enough fuel for getting out and getting back in plus 1/3 in reserve.
4. Move equipment onto boats.	Handling of instruments and equipment could cause strain to worker.	Carry instruments and equipment using proper lifting techniques (team lifts if equipment is more than 50 pounds, lift with legs and not back, do not twist while lifting, using mechanical lifting equipment as possible for heavy or awkward objects). Use care when walking so that there are no sudden jerks or missteps that can cause the worker to strain or be unable to maintain control of the equipment. Pond aeration units are heavy. Ensure a safe means to load and unload the aeration unit onto the airboat platform deck.
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only walk on surfaces that have the strength and integrity to support employees safely. Avoid walking on uneven or slippery surfaces.

ACTIVITY HAZARD ANALYSIS (AHA)
Submerged Sediment Aeration and Oil Recovery
(Tasks as contained in the SOP (Rev. 4)

Analyzed by/Date: Jennifer Fadden, Tetra Tech EC, Inc. 9/21/10

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
	Worker could fall off of dock or boat into water.	Wear USCG-approved Type I, III or V life preservers (personal flotation devices) when on water. Ensure adequate ramps or embarkation points onto boats. Life rings (Type IV PFD) and ropes meeting USCG requirements will be placed on or near debarkation points for vessels and will also be on each boat. Securely anchor or dock boats. Position docked boats with minimum of two lines. Do not load boats in adverse weather conditions that could jeopardize safe loading of the boat.
5. Operate boats to mobilize to work locations	Worker could fall overboard.	Wear USCG-approved Type I, III or V life preservers at all times when on water. Remain seated whenever boat is moving. Do not operate boat in adverse weather conditions that jeopardize safe operation of the boat.
	Boat could sink, tip, or get stranded.	Do not exceed maximum weight capacity for boat. Operate boat with a minimum of two personnel on board. Only experienced and qualified/designated boat operators will operate the boats. Do not use boat without shore support personnel and remain in radio contact with shore support personnel. Before disembarking rescue boat ensure that the USCG has been contacted.
	Boats could come into contact with other boats.	Watch for other boats in area and avoid close calls or collisions. Watch for wake from other boats. Operate boats at slow speeds for the water conditions and operational rules in the HASP. Be familiar with the "Rules of the Road" that regulate movement of boat traffic. Verify that boats have required USCG-approved lighting and signaling devices as applicable. Ensure a radio is on board to communicate emergencies.
	Noise	Wear hearing protection when on or adjacent to operating airboats.
	Boat motor/prop (Jon Boat) or bottom of airboat could contact debris or sediment surface.	Operate boats carefully and at slow speeds to limit potential for striking objects and review maps for locations that may contain debris or sandbars. Avoid sediment surface by angling boat motor to an angle of 30 degrees. Watch for objects hidden under water. Give wide berth to rocks, trees, ledges and man-made subsurface obstructions.
	Equipment could shift or fall overboard.	Do not place instruments or equipment near edge of boat when not in use or not secured. Secure equipment to boat if there is potential for equipment to shift or fall overboard. Secure all radios and cell phones. Maintain good housekeeping onboard.

ACTIVITY HAZARD ANALYSIS (AHA)
Submerged Sediment Aeration and Oil Recovery
(Tasks as contained in the SOP (Rev. 4)

Analyzed by/Date: Jennifer Fadden, Tetra Tech EC, Inc. 9/21/10

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark or eliminate slip, trip, and fall hazards. Only work on surfaces that have the strength and integrity to support employees safely. Maintain work areas and means of access in a safe and orderly fashion. Ensure that loads are properly distributed in boat.
	Fire or spills could occur.	Practice proper fuel storage and use on boats. Promptly clean up any fuel spilled on deck. No smoking on boats or on river during work shift and no open flames. Smoke only in designated areas. Carry one 10-pound, ABC, dry chemical fire extinguisher on boat. Evacuate boat if fire cannot be contained with one fire extinguisher and call 911 to initiate a response.
6. Placement of boom along perimeter of work area (shoreline) and placement of grid stakes	Handling of equipment and material or position of worker could strain or cause injury to worker.	Follow boom deployment practices in Section 3 of the HASP. Handle equipment and materials using safe lifting techniques and avoid excessive leaning or stooping which could cause back strain if performed repeatedly. Get assistance from other workers if loads greater than 50 pounds must be lifted.
	Pinch points could be present.	Use care when handling equipment and materials. Avoid areas where your hands or body could become pinched in equipment or between boat and other obstacles. Wear leather gloves when working with rough equipment or tools and get assistance from other workers if necessary.
	Drowning or immersion hazards; including cold stress	Keep PFD on at all times. Never work alone when on or in the water. Avoid immersion that is greater than hip level and place footing carefully to avoid sudden deep water or shelves and minimize tripping and falling into the water should wading be required. Attempt to deploy materials from boat if possible rather than walking. Areas that are greater than 4 feet in depth will be flagged red. Have extra clothing or blankets available in the event someone gets wet and cold. Monitor for cold stress hazards.
	Biological Hazards (applicable for all tasks)	Wear DEET or other insect spray if mosquitoes or other insects are prevalent. Do not handle wildlife directly. Report distressed wildlife to 1-800 306-6837. Carry a first aid kit. Ensure first aid/CPR trained (minimum of 2 persons) are on the aeration crew who have been trained in bloodborne pathogens precautions in the event CPR and/or first aid is required. Know how to identify poisonous plants and avoid contact with brush during placement of booms.

ACTIVITY HAZARD ANALYSIS (AHA)
Submerged Sediment Aeration and Oil Recovery
(Tasks as contained in the SOP (Rev. 4)

Analyzed by/Date: Jennifer Fadden, Tetra Tech EC, Inc. 9/21/10

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
	Contaminated Sediments - Chemical Hazards	Personnel must be 40-hour HAZWOPER trained. Minimize potential for contact with contaminated sediments and surface oil by minimizing personnel entry into contaminated areas to the extent possible (e.g., walking). Wear PPE to protect hands, clothing, and feet from becoming contaminated by oil (as per HASP). Wear safety glasses; goggles if splash hazards exist. Practice good personal hygiene and wash hands and face before eating lunch or drinking fluids - avoid hand to food contact or hand to mouth contact if hands are contaminated (ingestion hazards). Practice good housekeeping to keep oil out of the boat, off equipment, and off personnel to the extent possible. Follow proper decontamination procedures. If clothing becomes contaminated, use rags or sorbent pads to clean surfaces and dry decontaminate boots until proper decon can be performed. Bag up used gloves and overshoes or Tyvek suits when done using them and turn in waste to proper receptacles.
7. Primary Oil Recovery Methods - (Aeration) Deployment and operation of pond aeration unit, skimmers, and air blowers	Aeration unit (or oil recovery skimmers if used) could get snagged in debris, boom, underbrush, stakes, or shallow areas, etc.	Mark areas of potential snags or shallow areas clearly with red tape and try to avoid them.
	Strains and sprains; slips, trips, and falls, falls into water when working the aeration unit controls, skimmer controls, or leaf blowers or when recovering contaminated booms and sorbent materials	Ensure ropes are not tangled upon deployment so that the equipment can be fed along the vertical and horizontal passes without entanglement and with least amount of effort of the operator. Ensure operator has enough room to operate the equipment and the area of operation is free of obstacles. Try to position in the boat for comfort during operation. If units get snagged or held up in shallow water, do not jerk on ropes to free the unit. Keep feet out of ropes and cord coils. Swap out tasks so that one person is not performing the same repetitive jobs for extended durations. Take breaks and stretch as necessary. Operate equipment (controls for aeration units, leaf blowers, recovery poles for retrieving sorbents) without leaning over the side of the boat. Wear harness or body straps to position and direct leaf blowers as necessary to reduce arm and back strain. Wear PFD at all times while on boat. Do not lift items heavier than 50 pounds alone or perform awkward lifts. Use team lifts and proper lifting technique. Use material handling devices as necessary.

ACTIVITY HAZARD ANALYSIS (AHA)
Submerged Sediment Aeration and Oil Recovery
(Tasks as contained in the SOP (Rev. 4)

Analyzed by/Date: Jennifer Fadden, Tetra Tech EC, Inc. 9/21/10

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
	Generator, Skimmer, and Leaf Blower Noise	Wear hearing protection when generator, skimmer, and/or leaf blower is operating or when airboats are operating.
	Fires and spills from generator or leaf blower use	Aeration unit will be explosion proof (rated for use in fuel areas). Do not refuel generator or leaf blower over the water or without spill containment device underneath unit. Only use proper UL-listed fuel containers. Do not overfill the tank. Have adequate sorbent pads under unit and available for immediate use and do not refuel equipment until manifold has cooled. Have a 10-pound dry chemical fire extinguisher on the boat. Only smoke in designated smoking areas. All boats with aeration units must have four gas monitors for continuous monitoring of the air.
	Electrocution	Generators and compressors must have ground fault circuit interrupter (GFCI) and extension cords suitable for use in wet environments. Operate equipment in accordance with manufacturer's recommendations. Maintain equipment and power cords in good working order. Inspect equipment before each use.
	Contaminated Sediments - Chemical Hazards	Personnel must be 40-hour HAZWOPER trained. Minimize potential for contact with contaminated sediments and surface oil by minimizing personnel contact entry into contaminated areas to the extent possible (e.g., walking). Wear PPE to protect hands, clothing, eyes, and feet from becoming contaminated by oil (as per HASP). Wear safety glasses, goggles if splash hazards exist. Practice good personal hygiene and wash hands and face before eating lunch or drinking fluids - avoid hand to food contact or hand to mouth contact if hands are contaminated (ingestion hazards). Practice good housekeeping to keep oil out of the boat, off equipment, and off personnel to the extent possible. Follow proper decontamination procedures. If clothing becomes contaminated, use rags or sorbent pads to clean surfaces and dry decontaminate boots until final decon can be performed. Bag up used gloves and overshoes, other PPE, or used/contaminated sorbent materials when done using them and turn in waste to proper waste receptacles.
8. Secondary Oil Recovery Methods - (for red flag areas - manual water flushing, raking, or combination of both)	Electrocution using electrical equipment or pumps	Generators and pump must have ground fault circuit interrupter (GFCI) and extension cords suitable for use in wet environments. Operate equipment in accordance with manufacturer's recommendations including grounding and/or bonding as required. Maintain equipment and power cords in good working order. Inspect equipment before each use.

ACTIVITY HAZARD ANALYSIS (AHA)
Submerged Sediment Aeration and Oil Recovery
(Tasks as contained in the SOP (Rev. 4)

Analyzed by/Date: Jennifer Fadden, Tetra Tech EC, Inc. 9/21/10

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
	Fires and spills from generator and pump use	Do not refuel generator over the water or without spill containment device underneath unit. Only use proper UL-listed fuel containers. Do not overfill the tank. Have adequate sorbent pads under unit and available for immediate use and do not refuel equipment until manifold has cooled. Have a 10-pound dry chemical fire extinguisher on the boat. Only smoke in designated smoking areas. Use intrinsically safe pumps designed for use around oil, ground and bond equipment as required. All boats with aeration units must have four gas monitors for continuous monitoring of the air.
	Generator and pump noise	Wear hearing protection when generator, pump, or skimmer is operating or when airboats are operating.
	Contaminated Sediments - Chemical Hazards	Personnel must be 40-hour HAZWOPER trained. Minimize potential for contact with contaminated sediments and surface oil by minimizing personnel contact entry into contaminated areas to the extent possible (e.g., walking). Wear PPE as per the HASP and SOP to protect hands, clothing, eyes, and feet from becoming contaminated by oil (as per HASP). Wear safety glasses, goggles if splash hazards exist (such as when using or de-coupling pump or using water hose). Do not spray water toward personnel. Practice good personal hygiene and wash hands and face before eating lunch or drinking fluids - avoid hand to food contact or hand to mouth contact if hands are contaminated (ingestion hazards). Practice good housekeeping to keep oil out of the boat, off equipment, and off personnel to the extent possible. Follow proper decontamination procedures. If clothing becomes contaminated, use rags or sorbent pads to clean surfaces and dry decontaminate boots until final decon can be performed. Bag up used gloves and overshoes, other PPE, or used/contaminated sorbent materials when done using them and turn in waste to proper waste receptacles.

ACTIVITY HAZARD ANALYSIS (AHA)
Submerged Sediment Aeration and Oil Recovery
(Tasks as contained in the SOP (Rev. 4)

Analyzed by/Date: Jennifer Fadden, Tetra Tech EC, Inc. 9/21/10

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
	Strains and sprains; slips, trips, and falls, falls into water when working the pumps, rakes, and/or hose/nozzles, etc.	Ensure ropes and hoses are not tangled upon deployment so that the equipment can be operated without entanglement and with least amount of effort of the operator. Tie down or secure hoses that could whip around when pressurized. Ensure operator has enough room to operate the equipment and the area of operation is free of obstacles. Try to position in the boat for comfort during operation. If units get snagged or held up in shallow water, do not jerk on ropes to free the unit. Keep feet out of ropes and cord coils. Swap out tasks so that one person is not performing the same repetitive jobs for extended durations, especially tasks such as raking. Take breaks and stretch as necessary. Operate equipment (controls for pump, hoses, sorbent retrieval devices) without leaning over the side of the boat. Wear harness or body straps (if necessary) to position and hoses as necessary to reduce arm and back strain. Wear PFD at all times while on boat. Wear gloves when handling hoses or rakes. Do not lift items heavier than 50 pounds alone or perform awkward lifts. Use team lifts and proper lifting technique. Use material handling devices as necessary.
	Boating, drowning and water immersion hazards	See same in above sections.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles- pickup trucks	Daily and before use.	Only Department of Motor Vehicles-licensed personnel will operate vehicles
Boats and associated onboard equipment and safety devices	Inspect equipment before each use following manufacturers' requirements. Ensure equipment is functioning properly before deployment	Only designated and experienced/certified (as required by USCG) boat operators will inspect and operate boats.
Generators, skimmers, aeration unit, pumps, hand tools such as rakes, water hoses, wrenches, blowers, etc. (hand, power, electrical equipment)	Inspect each tool or equipment before each use. Discard and replace or repair tools that are defective or damaged. Repair in accordance with manufacturer's specifications.	Persons inspecting or using equipment must be familiar with hazards of the tools and equipment, proper use of the tools and equipment as per manufacturer specifications, including safe operation and emergency shutdown procedures.
Any equipment use or work within the warm or hot zone where contamination is present and being handled	Inspect equipment daily before use. Ensure equipment does not present a breathing hazard, spark or fire hazard, or personnel contamination hazard	40-hour HAZWOPER required. Site specific orientation and HASP review, including site contaminant hazards and how to minimize exposure, material safety data sheets (MSDS), use and limitations of PPE, HAZCOM, etc.
Gas monitoring devices	Inspect and calibrate daily before use and according to manufacturer specifications	Qualified operator familiar with use and limitations of the equipment and how to interpret the monitoring data.

Abbreviations and Acronyms:

AHA – Activity Hazard Analysis
GFCI - ground fault circuit interrupter
MSDS – Material Safety Data Sheet
PFD- personal flotation device
PPE – personal protective equipment
USCG – United States Coast Guard
HAZCOM - Hazard Communication

APPENDIX D – Remediation Closure Form

Talmadge Creek/Kalamazoo River
Submerged Oil Remediation
STATUS TRACKING FORM

DATE:

EPA(REP):

ENBRIDGE(REP):

LOCATION
(Division/Sect/MP) _____

CLEANUP METHODS USED

Method: _____ Notes: _____

Method: _____ Notes: _____

Method _____ Notes: _____

OIL COLLECTION METHODS USED

Method:

Method:

DISCERNABLE OIL
OBSERVED (end of day)

Sheen(heavy, medium, **light)** _____ Globules _____

SITE RECOMMENDED FOR FINAL INSPECTION/APPROVAL (Yes/no):

Team Lead:

Comments:

Remediation Complete **SITE APPROVAL**	*Name*	*Signature*	*Date*
EPA:			
Enbridge:			

APPENDIX E

ACTIVITY HAZARD ANALYSIS

AHA 1 - Shallow Dredging using Amphibex "Walking" Excavator (1 AHA is included)

AHA 2 - Management of Geotextile Tubes and Sediment Dewatering (6 AHAs - 01 through 06 are included)

AHA 3 - Treatment and Discharge of Dredged Water (6 AHAs - 01 through 06 are included)

Note: The Health and Safety Plan (HASP) for the Enbridge Line 6B MP 608 Marshall, Michigan Pipeline Release *(most current revision)* is the overarching HASP for the Ceresco Dam Sediment Removal Project, including emergency procedures to be followed. The AHAs herein are intended to address task specific hazards and the mitigation of those hazards which are unique to the tasks being performed. These documents work in conjunction with one another and are part of the Enbridge Safe Work Permit/Hazard Assessment process (HASP Part 1).

To facilitate correlation of these AHAs to the Enbridge HASP, the first page of this Appendix contains the Table of Contents (Rev. 3, August 30, 2010) from the Enbridge HASP.

TABLE OF CONTENTS

AHA 1
Shallow Dredging using Amphibex “Walking” Excavator

Petersen Companies Inc.
7560 Poplar Dr.
Minocqua WI. 54548
(715) *356-7311*
Kent Petersen’s Cell: [redacted]

9/15/10

RE: Sediment Removal Kalamazoo River (Ceresco Dam)
SUBJECT: JOB HAZARD ANALYSIS

Dear Sir or Madam:

The following is submitted as our **Job Hazard Analysis** for the protection of the life and health of employees, visitors and persons engaged in the prosecution of this Contract.

The following are items that are considered project specific hazards and the procedures followed to prevent them or remedy them in the event they do happen will be covered before the job is started and reviewed during weekly toolbox talks. The activity hazard analyses (AHA) for the work tasks performed during this project are included in Attachment A.

The dredging will be performed using an Amphibex "walking" excavator vessel. The excavator vessel has a hull that allows it to operate like a boat and has spuds that can be placed into shallow water and pontoon stabilizers which function to both stabilize the vessel in fixed position and also allow the vessel to "walk" into position if necessary. The excavator arm is equipped with a slurry dredge head. The dredge head will be coupled with tubing and vacuum connection which feed sediment to the geotextile tubes being filled and managed on shore.

Summary of major hazards and mitigation of hazards:

BOATING OPERATIONS, WORK OVER AND NEAR WATER, AND MAN OVERBOARD:

1. Boating operations shall be in accordance with Section 2.03 (Working Near Water) and Section 2.04 (Operation of Boats) in the HASP.
2. Provide all employees with approved work vests (USCG approved personal flotation device (PFD) Type I, II, or III) and require them to be worn at all times when working on boats, on docks, over water, or adjacent to water (within 10 feet), or other areas without adequate safety rails where a drowning hazard may exist. When the operator of the Amphibex excavator is wearing seat belt within excavator cab, the PFD may hinder safe operation of the equipment, the operator need not wear a PFD, but shall have one immediately accessible.
3. Man overboard drills are held initially, and then at irregular times to ensure all employees are aware of them and know their duties are during an actual man overboard event.
4. The procedure for a man overboard drill will be explained to all new employees prior to beginning work.
5. In the event of a person falling overboard, the person discovering the man overboard will immediately throw the person a life ring and notify the operator to shut down the equipment. The person will be assisted on board the vessel and the event will be reported in accordance with the HASP.
6. Should assistance be required (e.g., boat from shore at geotextile tube station), the shore staff (who have a boat and boat operator on shore) will be notified via radio or cellular telephone and will be mobilized out to assist.
7. Suitable approved handrails, lifelines, safety lines and non-skid decking is present and will be maintained in good order.

MAJOR ACCIDENTS:

1. A minimum of two First aid/CPR trained persons are provided on job site to give first aid/CPR in the event of an emergency.
2. The project Health and Safety Plan (HASP, including the Emergency Response Plan (See Section 2.0.5 of the HASP) is provided on the vessel listing the nearest hospital and emergency services and emergency contact information. Employees are briefed on these procedures upon mobilization.
3. To avoid major accidents and spread awareness of site hazards, a weekly safety meeting is held and safety inspections are made by our own Safety Personnel, as well as, others. In addition, daily safety meetings will be

attended by all personnel and the work will be subject to the Enbridge Safe Work Permit process.

4. In the event of a medical emergency or injury, immediately after the injured person is provided for medically and emergency services are notified, appropriate agencies and client contacts will be immediately notified as per Section 2 Event Reporting procedures in the HASP as well as any internal notifications required.

FIRE:

1. Fire bills are posted onboard the vessel and drills are held to insure employees are aware of the correct procedures and use of the equipment in case of fire.
2. The HASP, Section 2 (F) will be followed to minimize the potential for fires and respond to fires.
3. A properly rated fire extinguisher is provided on the vessel and inspected at regular intervals to insure it is in proper working order. All individuals working on the vessel will be trained in fire extinguisher use and limitations.
4. The signal for a fire onboard is to be continuous short whistle or horn blast. Dismissal of three short blasts.
5. The vessel is equipped with a fire alarm.
6. Page 6 of PCI's Safety Program is incorporated into this Job Hazard Analysis.
7. Fires are to be reported immediately via VHF radio and to site/operations management personnel. Shore operations will have VHF radio communications with vessel crew, who can respond to retrieve personnel should evacuation be necessary.

LOADING AND MOVING PIPELINE:

1. See "Hoisting Equipment" next paragraph, which is directly applicable to this task.
2. A qualified signaler or spotter will be present when loading and moving pipeline to ensure all persons stand clear of loads and to communicate with the crane or excavator operator.
3. Pipe being loaded will be hoisted with approved and properly rated hook type slings. A tag line will be used when necessary to keep loads from swinging.
4. After pipe is loaded, it will be secured to the deck with a chain(s) and loading binder(s) suitable to ensure it will remain in place.
5. When pipe is hand carried, there will be enough people provided to prevent back injury, slipping, etc. Persons will not individually lift over 50 pounds. Team lift or material handling equipment will be used for larger or heavier loads.
6. Stay a minimum of 15 feet from overhead power lines.

HOISTING EQUIPMENT:

1. Section 2.19 of the HASP addresses Mobile Lifting Equipment
2. Hoisting equipment will be operated and inspected by qualified personnel and a competent person will be named as "rigger".
3. Wires, shackles, hooks, winches, etc., are load tested and undergo preventative maintenance at regular intervals to ensure they remain serviceable and are inspected before each use by a qualified person. Properly rated lifting equipment will be used at all times; sufficient for the load being hoisted.
4. Boom stops, back up alarms and signalmen are used to prevent struck-by hazards.
5. All persons not actually engaged in the hoisting procedure are instructed to stand clear.

BOARDING AND DEBARKING OF FLOATING EQUIPMENT:

1. Suitable grab rails, walkways, landing ramps and lifelines are provided for personnel safety and egress.
2. All persons are to wear USCG-approved Type I, II, or III PFD while boarding or debarking floating equipment unless a gangway with guard rails is provided.

MOVING MACHINERY (GEARS, WINCHES, ETC.):

1. Hazardous areas such as pinch points and swing radius/counterweight radius will be clearly demarcated. Machine guards and warning signs or stickers (where required or provided by manufacturer), will remain in place and will not

be bypassed or rendered inoperable or illegible. Should additional areas be identified that are hazards to personnel, they will be demarcated (with signage or danger tape).

2. Guard Rails are provided around moving equipment to prevent people from slipping or falling into moving machinery. Personnel must have clear access to and knowledge of any emergency stop mechanisms where provided for the shutdown of equipment in an emergency.
3. Remotely controlled electrically powered machinery is provided with positive electrical disconnects at the machinery location.
4. **NO** maintenance is done while moving machinery is in operation. Lockout-tagout procedures will be followed as required for performing maintenance on equipment that has hazardous energy.

TOWING LINES:

1. All towlines (if required) are provided with suitable material to prevent backlash in the event of parting.
2. When making up tow, all lines are flaked down before being strung out. As lines are strung out, all personnel are kept clear to avoid entanglement in running lines.

HEAVY EQUIPMENT:

1. Cranes and/or excavators will be operated by qualified and where required, licensed/certified operators only. Because the Amphibex is also a vessel, boating operations experience (captain/mate/deckhand) will be required as per U.S. Coast Guard requirements.
2. Boom stops, back up alarms and rollover bars are provided as per manufacturer specifications or site specific requirements.
3. Crane and/or excavator certifications (equipment and operators) will be provided prior to mobilization.
4. Crane and/or excavator loads will not exceed the crane load chart specifications.
5. Personnel working around operating heavy equipment will wear reflective high visibility garments and will obtain permission of the operator before entering any hazardous areas where they could be struck (e.g., swing radius, areas where the spuds and/or pontoon stabilizers would articulate. The operator will ensure persons on the vessel are in a safe location prior to moving spuds or pontoon stabilizers.
6. Spill response supplies will be maintained in an accessible location in the event of a spill due to hydraulic system or other system failure resulting in a leak. Spills will be reported per the HASP. Refueling activities for the vessel will be in accordance with the HASP.

STORMS:

1. The NOAA weather radio will be monitored at all times.
2. When the Captain receives storm warnings that are considered hazardous or could become hazardous, necessary steps to stop operations and, if necessary, return and secure vessel at the shoreline (or dock) will be taken.
3. The 30-second rule for lightning (Section 2.05 Section E of the HASP) will be followed and personnel will seek shelter indoors (in equipment, in cabs, etc. and will not be on deck or on small boats that do not have an enclosed cabin.
4. Make all equipment fast to prevent washing overboard or slipping on deck and causing injury to persons or equipment.
5. Radio contact with the shore operations will be maintained at all times and communications will be tested regularly.
6. Emergency numbers are posted onsite.
7. All persons are familiar with emergency procedures and man overboard drills.
8. The Coast Guard will be notified that PCI is using Channel 13 and 16.

DREDGING WITH THE AMPHIBIOUS EXCAVATOR:

1. All deployed parties will remain in radio contact with the superintendent and shore operations.
2. Dredge positioning checks will be performed continuously.
3. All work areas will have lights for nighttime dredging that provide sufficient illumination as per Section 2.04 of the HASP (Operation of Boats after Dusk) and nighttime operations if performed will be included in the Work Permit.
4. This job hazard analysis incorporates each area of PCI's Safety and Quality Control Program to create a continuous and comprehensive accident prevention program.

ELECTRICAL:

1. Any work performed on or near energized lines shall be in accordance with the most recent version of EM 385-1-1.
2. If de-energizing the line is required, site specific electrical outage requests must be given in advance.

HAZARDOUS MATERIALS ANALYSIS:

1. Petroleum-contaminated sediments will be dredged on this project and 40-hour HAZWOPER certification and medical clearance is required for handling or working around contaminated sediments. Site specific hazards of the contaminants are addressed in the HASP (Sections 2.02 and MSDS sheets in Appendix A of the HASP and include heavy crude oil, benzene, hydrogen sulfide, carbon monoxide, and hexane.
2. Fuel and oils or other lubricants will be handled in boats or in equipment or engine room.
3. Hazcom training is required per OSHA regulations.

PPE ANALYSIS:

The dredge work will be performed using Level D PPE as follows:

- Standard Work ensemble will include full length pants, hard hat, safety glasses with side shields, steel toed boots, and high visibility vest. Work gloves (leather or canvas) will be worn when using tools, moving pipe, or other deck related functions as long as use of the gloves does not interfere with dexterity making the task less safe. Hearing protection as required. Hard hats need not be worn in the cabin of the vessel.
- A Coast Guard approved Type III PFD will be worn at all times when working on the water. Exception is for the operator of the excavator on Amphibex when in the operational seat or within the working cabin of the vessel.
- A Coast Guard approved Type I, II, or II PFD will be worn on docks or other areas within 10 feet of the water or areas without adequate safety rails.
- Personnel and observers will take care to minimize contact with contaminated media. When handling contaminated sediments (contact hazard), contact will be limited during this operation. Should contact be required, nitrile gloves will be available for use. If clothing could become contaminated, either Tyvek suits or disposable raingear may be worn. If splash hazards exist, a face shield or goggles will be worn. Work boots may either consist of disposable overshoes or rubber work boots (that can be decontaminated).

ATTACHMENT A

ACTIVITY HAZARD ANALYSIS (AHA) 1

Project: Ceresco Dam Dredging Project; Marshall/Enbridge Line 6 Release		**Location: Marshall, MI**
Activity: Shallow Dredging using Amphibex "Walking" Excavator		**Approved by:**
PRINCIPAL STEPS	**POTENTIAL SAFETY/HEALTH HAZARDS**	**RECOMMENDED CONTROLS**
Operating mechanical equipment (excavator, winches, power drives, spuds, hydraulics, boats, etc.)	Struck by excavator or moving equipment	- Boat/vessel operators must be qualified to operate the vessel or boat. In some instances, licenses are required. Deckhands will be qualified as well. - Excavator operator will be a qualified operator experienced in the proper operation of the Amphibex equipment. - Contact excavator operator (visual, radio, phone) and have him/her stop work and shut down equipment before approaching equipment. - Establish eye contact with operator and have a clear signal from operator before approaching equipment. - Do not approach excavator from blind spots. - Do not stand or bring boats near swing radius of counterweight and bucket - Wear high intensity visibility garment when working around excavator and with the geotextile tube management team. - Stay out of area between moving equipment and other fixed objects such as the stabilizer deployment areas.
	Contact with exposed moving parts (i.e. gears, pulleys, sprockets, drive chains, spud extenders, etc.)	- Inspect mechanical equipment for exposed moving parts and install guards (do not remove guards). - Maintain safe distance from unguarded mechanical equipment until hazard can be corrected. Ensure area around equipment is secured and hazard warning signs are displayed or have defective equipment taken out of service. - Make sure kill switches for mechanical equipment are located within operator's reach. - Place guards over exposed winch drums and spools if possible (if present).
	Noise	- Wear hearing protection if noise levels exceed 85 dBs. - Have regulated areas established around high noise areas and post noise warning signs. - Implement hearing conservation for employees exposed to noise levels in excess of 85 dBs. - The Amphibex is designed to be quiet in operation.

Project: Ceresco Dam Dredging Project; Marshall/Enbridge Line 6 Release Activity: Shallow Dredging using Amphibex "Walking" Excavator		Location: Marshall, MI Approved by:
PRINCIPAL STEPS	**POTENTIAL SAFETY/HEALTH HAZARDS**	**RECOMMENDED CONTROLS**
	Struck by flying debris or being splashed with contaminated sediments	- Wear impact-resistant, ANSI-approved safety glasses with side shields if not within the enclosed cab of the vessel - Keep excavator wind shield closed if there are flying debris or splash hazards - Have a means to clean windshield to maintain visibility if windshield becomes dirty - Personnel and observers will take care to minimize contact with contaminated media. - This involves a conscientious effort to keep "clean" during site activities. - When the potential for contact with contaminated media exists, personnel and observers will wear appropriate PPE described in the HASP to minimize if not prevent exposure. *For Decontamination*-Personnel and observers will wash hands and face after leaving the contamination reduction zone with soap and water or waterless hand cleaner. *For Decontamination*-Personnel and observers will perform DECON of Equipment and PPE in the contamination reduction zone per HASP requirements.
	Electrical shock	- Inspect equipment to make sure there is no defective or exposed wiring. - Ensure electrical equipment is properly grounded. - Keep electrical equipment dry and away from pooled water. - Ensure electrical equipment is connected to ground fault circuit interruptors. - De-energize electrical equipment, secure it, and lock it out before conducting repairs. - Excavator bucket and boom must maintain at least a 15 ft. clearance from overhead powerlines. - Conduct search for buried or submerged utilities before dredging.
	Struck by deck lines under tension and/or other unsecured equipment.	- Establish safety zones around mooring and anchor lines under tension (if present). - Secure all equipment on and below deck. - Stay clear of loads being lifted by on-board derricks. - Demarcate areas where lines may shift or spud/stabilizer movement areas and do not get in between these areas.
Working on decks or adjacent to dredge equipment	Slip and trips	- Clear work area and walkways of obstructions. - Wear high traction, safety toe footwear. - Keep walkways dry or surface with slip-resistant materials - Ensure ladders are properly placed and secured and in good condition - Inspect work areas daily.
	Struck by dropped, flying objects	- Wear ANSI approved hard hat, safety glasses, safety-toe footwear

Project: Ceresco Dam Dredging Project; Marshall/Enbridge Line 6 Release Activity: Shallow Dredging using Amphibex "Walking" Excavator		Location: Marshall, MI Approved by:
PRINCIPAL STEPS	**POTENTIAL SAFETY/HEALTH HAZARDS**	**RECOMMENDED CONTROLS**
	Slips/trips/falls changing elevations	- Provide stairs, ladders or ramps when elevation changes greater than 19 inches are necessary. - Use three-points-of-contact ascending and descending stairs and ladders
	Pinch points, articulation hazards and swing radius hazards	- Stay out of swing radius of boom and counterweight - Do not approach equipment without operator permission - Do not get near the spuds/stabilizer articulation zone unless operator gives permission and secures the vessel - Never go underneath the amphibious excavator when elevated
	Falls to lower level, (e.g. open hatches, from docks or overwater platforms etc.)	- Close all open deck hatches or guard those that must remain open (if present). - Wear PFD when working on-board vessels, on docks or on over-water platforms that are unguarded (within 10 feet of edge). During night operations, PFDs must be equipped with flashing beacons. - Ensure dredge crew is aware of your whereabouts at all times. Have a means of communication that is understood by crew. - No standing on or leaning over edge of dredge platform or vessel guardrails. - Do not work alone. Observe the "buddy rule." - Have rescue boat moored to dredge or nearby at shore operations area at all times with a boat operator on standby. - Rehearse man overboard drill regularly - Stage life rings on port and starboard sides of dredge. - Use personal fall protection or work within guardrail protected areas when accessing or moving about.
	Inadequate communications	- Perform radio checks regularly. Ensure cellular telephone reception on the vessel and have a list of contacts, emergency numbers, and backup contacts.
	Falls from elevations	- Ensure all elevated (> 6 ft. high) catwalks, aisleways, gangways, stairways, and work platforms are equipped with guardrails. - Ensure fixed ladders are equipped with fall protection (i.e fall cages). - Ensure all floor openings are covered before accessing work areas. - Elevated surfaces not designed as work platforms must be evaluated by a qualified person for structural capacity before using as a work platform
	Thermal stress	- Monitor environmental temperatures and level of work activity. - Track thermal loads. - Provide shaded rest areas, water, and work-rest cycles during high heat stress conditions. - Wear thermally insulted clothing during cold stress conditions. - Inform personnel of thermal stress symptoms, treatments, and controls.

Project: Ceresco Dam Dredging Project; Marshall/Enbridge Line 6 Release Activity: Shallow Dredging using Amphibex "Walking" Excavator		Location: Marshall, MI Approved by:
PRINCIPAL STEPS	**POTENTIAL SAFETY/HEALTH HAZARDS**	**RECOMMENDED CONTROLS**
	Noise	- Wear hearing protection if noise levels exceed 85 dBs. - Have regulated areas established around high noise areas and post noise warning signs. - Implement hearing conservation for employees exposed to noise levels in excess of 85 dBs.
	Hazards from tool use (e.g., pipe loading) - pinch points - strains and sprains - abrasions and cuts - electrocution - flying debris	- Keep hands out of pinch points and wear leather work gloves - Use the correct tool for the job - Secure chain binders carefully so they do not snap back into face or hands - Do not use heavy tools over shoulder height. - Where tool use is necessary on a continuous or repetitive basis take frequent breaks to rest muscles and joints, particularly if working in awkward positions - Use lightest tool acceptable for application - Use anti-vibration gloves for repetitive use of high velocity or high impact tools, such as impact wrenches, reciprocating saws, etc. - Use GFCI and marine grade extension cords for power tools on vessel. - Inspect tools before use and inspect power cords before use. - Wear safety glasses with sideshields and wear hardhat. - If grinders are used, wear face shield. - Ensure tools are used and guarded per manufacturers specifications - Ensure workers know proper use and limitations of the tools being used.
	Back strain from heavy lifting	- Limit lifting to 50 lbs./ person or less - Use proper lifting techniques - Have other crewmembers help lift heavy loads. - Use mechanical lifting equipment when feasible.
	Inadequate illumination	- Inspect work areas for inadequate illumination. - Install additional lighting to ensure all work areas are illuminated with at least 5 foot-candles of light. - Have crewmembers use portable lighting (lanterns, flashlights) as needed. - Ensure all portable lighting is explosion-proof and connected to ground fault circuit interruptors.

Project: Ceresco Dam Dredging Project; Marshall/Enbridge Line 6 Release Activity: Shallow Dredging using Amphibex "Walking" Excavator		Location: Marshall, MI Approved by:
PRINCIPAL STEPS	**POTENTIAL SAFETY/HEALTH HAZARDS**	**RECOMMENDED CONTROLS**
	Fire and explosion	- Make sure on-board fire system is fully functional and all crewmembers know their fire fighting duties and limitations. - Stage portable fire extinguishers in work area. - Store all flammable liquids (paints, solvents, thinners, etc.) in flammable liquid storage locker. - Maintain directory of MSDS sheets on-board dredge. - Ensure employees are trained to use portable fire extinguishers. - Abandon vessel if fire cannot be contained at incipient stage or there is an explosion. - Have a shallow-draft boat and boat operator immediately available to the dredge should an emergency occur if one is not secured to the dredge as an alternate means of egress. - Smoking is allowed only in designated areas.
	Spills and releases	- Stockpile spill response equipment, such as, floating boom, absorbent pads, vermiculite, overpack drums, plastic bags, duct tape and personal protective equipment on-board dredge or immediately available to the crew to respond. - Notify appropriate regulatory agencies in the event of a spill per the incident command system. Ensure all current emergency phone numbers and contacts are posted. - Ensure dredge crews are trained in spill response. - Isolate spill area, eliminate ignition sources, and evaluate risks before responding to a spill.
Operating crew boat.	Falling overboard and drowning	- Ensure boat and excavator platforms have guardrails as appropriate. - No standing or leaning over edge of boat or dredge platform. - Rehearse man overboard drill. - Vessel must have at least one throwable PFD (Type IV PFD) - preferable to have one on port and one on starboard side. - All personnel on board must wear PFDs (except excavator operator who is working within the cabin.
	Colliding with other boats operating in area or colliding with amphibious excavator	- Maintain vigilance and ensure boat/equipment has proper running lights (when required). - Notify other site contractors of work location as applicable. - Comply with Coast Guard right-of-way rules. - Use horn to signal or warn other boats or operations as appropriate. - Suspend work during bad weather or poor visibility. - Have experienced boat crews operate vessel - Make sure running lights and position lights are operational. - Do not operate boat in rough seas or severely reduced visibility. - Do not operate boat near excavator unless operator has coordinated with excavator operator - stay clear of spuds.

Project: Ceresco Dam Dredging Project; Marshall/Enbridge Line 6 Release Activity: Shallow Dredging using Amphibex "Walking" Excavator		Location: Marshall, MI Approved by:
PRINCIPAL STEPS	**POTENTIAL SAFETY/HEALTH HAZARDS**	**RECOMMENDED CONTROLS**
	Vessel mechanical failure or on-board emergency (i.e. fire, loss of power, etc.)	- Inspect vessel for mechanical integrity before each use. - Communicate fire and emergency evacuation procedures to all - vessel occupants. - Ensure radio communications with Coast Guard are available. - Ensure emergency life boats, life rings and vests are available. - Verify presence and working order of fire extinguishers.
	Heavy Lifting	- Limit lifting to 50 lbs./ person or less - Use proper lifting techniques - Use mechanical equipment when feasible.
	Cold stress	- Wear thermally insulated clothing as appropriate. - Wear raingear when needed - Take frequent warm-up breaks in heated boat cabin - Review thermal stress treatments and controls with personnel.

AHA 2
Management of Geotextile Tubes and Sediment Dewatering

Infrastructure Alternatives, Inc.
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Rockford, MI. 49341
(616) ***866-1600***

1.0 PROJECT OVERVIEW

The following Activity Hazard Analysis (AHAs) cover work performed by Infrastructure Alternatives, Inc. (IAI) as part of the Ceresco Dam Dredging Project which will take place in Marshall, MI at the Jim Olds farm property:

13200 12 Mile Rd
Ceresco, MI 49033-9685

This project is being conducted for the purpose of removing oil contaminated sediment from the Kalamazoo River. The contaminated sediments will be received from the dredge activities via suction dredge techniques.

Landside work that IAI is responsible for performing includes:

- Mobilize personnel and equipment to site
- Construct the geotextile tube header system
- Deploy and operate geotextile tubes
- Decontaminate equipment and piping
- Demobilize personnel and equipment from site

2.0 HAZARD IDENTIFICATION & CONTROLS

The following table identifies the potential hazards associated with each task to be performed by IAI.

Table 1: Identification of Potential Hazards

Potential Hazards	Unload/Load equipment & materials	Construct geotextile tube header sys	Deploy & operate geotextile tubes	Decon piping & equipment
Back injury	X	X	X	X
Chemical exposure			X	X
Cuts, abrasions	X	X	X	X
Elevated work areas, falls	X		X	
Entanglement, pinch points	X		X	
Exposure to site contaminants			X	X
Fires		X		
Heat/Cold stress	X	X	X	X
Heavy equipment	X	X	X	X
High pressure water spray				X
Noise > 85 decibels	X	X	X	X
Overhead lines	X			
Power tools		X	X	
Rigging, elevated loads	X		X	X
Severe weather	X	X	X	X
Slips, trips, falls	X	X	X	X
Vehicle traffic	X	X	X	X
Working over, near water	X	X	X	X

3.0 Geotextile Tube Operations

Operation of geotextile tubes poses special safety concerns. Personnel who are unfamiliar with geotextile tubes must be thoroughly trained on the hazards of filling geotextile tubes and the hazard controls which are used to protect the dewatering crew.

4.0 Slips, Trips & Falls from Geotextile Tubes

Geotextile tubes are wet and slippery during the filling process and height of the tubes can be in excess of 6 feet creating a fall hazard. Walking on the geotextile tube surface can be dangerous, but is necessary for proper operation. To prevent slips and falls from the tubes:

- The top surface of the geotextile tubes will be flagged around the perimeter. Personnel will not walk or climb on geotextile tubes outside of the flags.
- Personnel will use ramps to climb up on geotextile tubes; catwalks will be used to walk from one geotextile tube to another. Ramps and catwalks will be kept clean but may be wet and therefore slippery. Personnel will take caution.
- Personnel will not walk alone on tubes in low-light conditions.
- The work area must have a minimum of 5 foot-candles of light (rule of thumb: enough light to easily read the small print of a newspaper). Light plants or other artificial lights will be used as needed to provide enough light to safely operate the tubes.

5.0 Geotextile Tube Rupture

Geotextile tubes may rupture (fail structurally) during filling, causing a sudden flow of water and dredged material. To prevent failure of geotextile tubes and possible engulfment of personnel:

- Extreme care will be taken when handling geotextile tubes to prevent punctures or weakening of the geotextile material.
- Technicians will remain in sight of the geotextile tubes at all times during the filling process.
- Geotextile tubes will never be filled to greater than their rated maximum fill height: for this project, 8 feet. Laser levels or measuring rods will be used to measure the height of the tubes.
- Geotextile tubes will be frequently inspected for rips, separations or places where the geotextile fabric has been weakened.
- Geotextile tubes will be deployed in such a manner as to prevent them from moving or rolling out of place. If movement or roll does occur, technicians will immediately stop flow to the tube and take steps to secure it before beginning the filling process again. Unstable geotextile tubes that cannot be stabilized will be abandoned.

6.0 ACTIVITY HAZARD ANALYSIS (AHA)

An Activity Hazard Analysis (AHA) describes a work activity, the particular hazards of the activity and the control measures that will be utilized to eliminate or reduce hazards to an acceptable level. It is a written document designed to provide personnel with all the information needed to perform the work activity safely.

The Site Safety & Health Officer is responsible for preparing AHAs for each major work task on site. (Subcontractors must develop AHAs for their own tasks, which must be approved by the IAI Corporate Health & Safety Dept. before work commences.)

IAI's AHAs for this project are included in the following pages. All personnel are required to review and sign IAI's AHAs prior to beginning work or entering the dewatering pad, and again whenever AHAs are updated and on an annual basis thereafter or should revisions to the site activity or hazards change.

Tasks to be performed by IAI personnel on site include:

AHA-01. Off-Road Forklift Operations
AHA-02. Unload Equipment & Materials Delivered to the Site
AHA-03. Use Hand & Power Tools
AHA-04. Construct Geotextile Tube Header System
AHA-05. Deploy Geotextile Tubes
AHA-06. Operate & Maintain the Geotextile Tubes & Associated Header System

AHAs for each of these tasks are included in the following pages.

AHA-01: Off-Road Forklift Operations

Description of Task: Off-road forklifts will be used to move materials (including but not limited to piping and geotextile tubes) around the site.	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Amber Wilson, [redacted]
	IAI Site Super: Brent Cardwell, [redacted]	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
1. Inspect the off-road forklift daily prior to use; document the inspection by completing the inspection form.	a. Physical injury/struck-by	i. Conduct the inspection in a safe area, away from foot and other vehicle traffic. ii. Notify other personnel working in the area that you will be conducting the inspection, especially if they are wearing hearing protection and may not hear the forklift's engine noise.
2. Use rigging as needed (for example, if the load is not skid mounted) to attach the load to the forks of the off-road forklift.	a. Rigging	i. Inspect rigging before use. ii. Never use rigging that is damaged or excessively worn. iii. Do not use rigging in excess of its recommended load. iv. Attach rigging to the load at designated pick points.
	b. Pinch points	i. Let heavy equipment do the work; slide forks under materials instead of sliding materials onto forks, etc. ii. Verbally and physically point out pinch points to other personnel as you work. iii. Keep hands and feet clear and stand back as materials are being lifted off truck or trailer. i. Wear heavy work gloves to protect hands and steel toe boots to protect toes.
3. Use the off-road forklift to move materials/equipment around the site.	a. Physical injury/struck-by	ii. Conduct a pre-task safety meeting to inform personnel working in the area of: what you will be moving, where you are moving it to and what route you will take. iii. Remove all unnecessary personnel from the area. iv. All personnel on site must wear chartreuse or orange safety vests with reflective tape to increase their visibility. v. Use a designated signal person to direct the movements of the forklift in tight areas, areas of limited visibility, or if the load obstructs visibility. vi. Use the lights and horn as needed to warn personnel of the forklift's approach.

	b. Elevated loads	i. Never work under loads, extended booms, forks or buckets. ii. Use taglines to guide load. iii. Remove unnecessary personnel from the area. iv. Ensure load is properly secured before it is lifted.
	b. Noise	i. The forklift operator must wear hearing protection. ii. Any ground personnel working in the area may also require hearing protection, if they will be exposed to forklift noise for longer than a few minutes.

Equipment List equipment to be used in this work activity	**Inspections** List required inspections for this work activity	**Training** List required training for personnel performing this
1. Off-road forklift 2. Rigging 3. Level D PPE – Hard hat – Safety glasses – 4" minimum shirt sleeve and long pants – High-visibility reflective safety vest – Chemical resistant coveralls (such as Tyvek) – Double layered nitrile gloves, sealed to coveralls with duct tape – Waterproof steel toe boots with non-skid soles, sealed to coveralls with duct tape – Hearing protection	1. Inspect off-road forklift daily before use, including a check of the backup alarm and horn. 2. Rigging must be inspected by a qualified person before every use. Check for fraying, wear and damage. Frayed, worn or damaged rigging will not be used. 3. Make sure the rigging to be used is adequate for the load.	1. Operators must have forklift training, with training documented and on file at the site. 2. Pre-entry briefing prior to beginning work on site 3. Pre-task safety meeting 4. 40-hour HAZWOPER training

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	**Signature:**	**Date / time:**
IAI Site Superintendent:	Brent Cardwell		
Site Safety & Health Officer:			
Employees:			

Employees:	Printed name:	Signature:	Date / time:

AHA-02: Unload Equipment & Materials Delivered to the Site

Description of Task: Equipment and materials such as geotextile tubes will be delivered to the site on flat-bed trucks. Items in excess of 50 lbs. will be unloaded using an off-road forklift, or if very large, a crane. Items less than 50 lbs. may be unloaded manually.	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Amber Wilson [redacted]
	IAI Site Super: Brent Cardwell, [redacted]	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
1. Equipment and materials are delivered to site by truck.	a. Large vehicles moving around site (struck by, vehicular accidents)	i. Designated personnel will be positioned to signal truck and control other traffic. ii. Personnel will wear a high visibility reflective safety vest. iii. Ground personnel will not approach a vehicle without the operator's permission. iv. Use wheel chocks on parked vehicles being unloaded to minimize potential vehicle rolling.
2. Access bed of delivery truck.	a. Slips, trips, falls	i. Personnel will access the trailer at designated access points (trailer steps) or use a step ladder. ii. Limit the number of personnel on the trailer to only those necessary.
3. Drive off-road forklift up to trailer; use rigging to secure equipment or materials in excess of 50 lbs. to the forks of the off-road forklift.	a. Rigging	i. Inspect rigging before use. ii. Never use rigging that is damaged or excessively worn. iii. Do not use rigging in excess of its recommended load. iv. Attach rigging to designated pick points.
	b. Pinch points	i. Let heavy equipment do the work; slide forks under materials instead of sliding materials onto forks, etc. ii. Verbally and physically point out pinch points to other personnel as you work. iii. Keep hands and feet clear and stand back as materials are being lifted off truck or trailer. iv. Wear heavy work gloves to protect hands and steel toe boots to protect toes.
	c. Noise	i. The forklift operator is required to wear hearing protection. ii. Any ground personnel working in the area may also require hearing

		protection, if they will be exposed to forklift noise for longer than a few minutes or greater than 85 decibels based on 8 hour time weighted average.
	d. Exposure to diesel exhaust	i. Avoid inhaling diesel exhaust by positioning upwind or away from exhaust plume; if someone inhales large amounts of exhaust, immediately remove them to fresh air. Provide artificial respiration if breathing has stopped. Get immediate medical attention.
	e. Physical injury (struck by heavy equipment)	i. Only certified operators may operate off-road forklift. ii. Operator will inspect off-road forklift daily before use, including check of safety equipment such as backup alarm and horn. iii. Operators will wear safety belt at all times when operating heavy equipment. iv. Operators will be alert for overhead lines, obstructions and ground personnel. v. Ground personnel will wear high visibility reflective safety vests.
4. Use off-road forklift to lift equipment or materials off truck and place in designated staging area.	a. Physical injury (struck by, caught between)	i. One person will be designated signal person. This person must remain in sight of the off-road forklift operator at all times. ii. Entire crew will review hand signals before beginning operation. iii. Review sequence of work with entire crew before beginning task. iv. Clear area of all unnecessary personnel. v. Ground personnel will not approach off-road forklift without the operator's permission. vi. Ground personnel will wear hard hat and high visibility reflective safety vest. vii. Ground personnel will not walk between moving vehicles and stationary points.
	b. Elevated loads	i. Never work under loads, extended booms, forks or buckets. ii. Use taglines to guide load. iii. Remove unnecessary personnel from the area. iv. Ensure load is properly secured before it is lifted.
5. Manually unload smaller/lighter equipment or materials that cannot be unloaded with the off-road forklift.	a. Physical injury (back strain, pinched fingers or toes)	i. Practice safe lifting techniques, such as: – Bend at the knees, keeping your back straight. – Turn with your feet; don't twist your body. – Keep the load close to your body, between your knees and shoulders. ii. Wear heavy work gloves to protect hands and steel toe boots to protect toes. iii. Pick up items in the way they were designed to be picked up (using handles, etc.)

		iv. Work with a buddy. v. Use off-road forklift to unload heavy items as much as possible.
	b. Overexertion	i. Work in pairs to lift anything in excess of 50 lbs. ii. Take rest breaks as needed. Rest more frequently the first few days on the job to acclimatize yourself.
	c. Heat stress	i. Drink cool water every 20 minutes when working in a hot environment. ii. Take water/rest breaks as needed. Rest more frequently the first few days on the job to acclimatize yourself. iii. Do heavy work during coolest part of the day. iv. Observe personnel for symptoms of heat-related illnesses, including: confusion, irrational behavior, fainting, hot, dry skin (lack of sweating), convulsions, headache, nausea, vertigo, thirst, weakness

Equipment List equipment to be used in this work activity	**Inspections** List required inspections for this work activity	**Training** List required training for personnel performing this
1. Off-road forklift 2. Rigging 3. Level D PPE – Hard hat – Safety glasses – 4” minimum shirt sleeve and long pants – High-visibility reflective safety vest – Chemical resistant coveralls (such as Tyvek) – Double layered nitrile gloves, sealed to coveralls with duct tape – Waterproof steel toe boots with non-skid soles, sealed to coveralls with duct tape – Hearing protection for forklift operator and ground personnel as needed	1. Inspect off-road forklift daily before use, including a check of the backup alarm and horn. 2. Rigging must be inspected by qualified person before every use. Check for fraying, wear and damage. Frayed, worn or damaged rigging will not be used. 3. Make sure the rigging to be used is adequate for the load.	1. Operators must have forklift training, with training documented and on file at the site. 2. Pre-entry briefing prior to beginning work on site 3. Pre-task safety meeting 4. 40-hour HAZWOPER training

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	**Signature:**	**Date / time:**
IAI Site Superintendent:	Brent Cardwell		

AHA-02: Unload Equipment & Materials Delivered to the Site

Site Safety & Health Officer:			
Employees:			
Employees:	**Printed name:**	**Signature:**	**Date / time:**

AHA-03: Use Hand & Power Tools

Description of Task: Hand and power tools will be used frequently on site for a variety of tasks, including construction and maintenance.	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Amber Wilson, [redacted]
	IAI Site Super: Brent Cardwell, [redacted]	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
1. Use hand and power tools	a. Exposure to electricity	i. Inspect electrical cords for damage or excessive wear before use. Do not use tools with damaged or worn cords. Protect cords from damage (e.g., being run over by equipment, sharp edges and corners, etc.) ii. Use Ground Fault Circuit Interrupters (GFCIs) when using electrical power tools in wet areas. iii. Use extension cords and other electrical equipment specifically designed for marine use when working in wet areas. iv. Power tools should have grounding plug or be double insulated. Damaged power tools must be taken out of service and either be repaired or replaced.
	b. Physical injury (cuts, abrasions)	i. Tuck in loose clothing, tie back hair and keep hands away from moving power tool parts. ii. Personnel will wear leather or heavy canvas work gloves to protect hands when using hand or power tools unless the loss of dexterity poses a greater hazard. iii. Use the proper tool for the job; do not use tools for a task that they were not designed. iv. Inspect tools before use; never use damaged or broken tools.

Equipment List equipment to be used in this work activity	**Inspections** List required inspections for this work activity	**Training** List required training for personnel performing this
1. Tools 2. Level D PPE – Hard hat – Safety glasses – 4” minimum shirt sleeve and long pants	1. Inspect all tools before use. Never use tools that are damaged or excessively worn.	1. Before using a power tool that they’ve never used before, personnel must receive instructions about how to safely operate the tool or review the O&M manual. 2. Pre-entry briefing prior to beginning work on site 3. Pre-task safety meeting

– High-visibility reflective safety vest – Chemical resistant coveralls (such as Tyvek) – Double layered nitrile gloves, sealed to coveralls with duct tape – Waterproof steel toe boots with non-skid soles, sealed to coveralls with duct tape – Hearing protection		4. 40-hour HAZWOPER training

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	**Signature:**	**Date / time:**
IAI Site Superintendent:	Brent Cardwell		
Site Safety & Health Officer:			
Employees:			

AHA-04: Construct HDPE Geotextile Tube Header System

Description of Task: Construct HDPE geotextile tube header system.	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Amber Wilson, [redacted]
	IAI Site Super: Brent Cardwell, [redacted]	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
1. Use hand and power tools.	a. Electrical hazards	i. Inspect electrical cords for damage or excessive wear before use. Remove from service any damaged cords.
	b. Physical injury (cuts, abrasions)	i. Stay clear of moving parts. ii. Personnel will wear heavy canvas or leather work gloves to protect hands when using hand or power tools unless the loss of dexterity poses a greater hazard. iii. Use the proper tool for the job. iv. Inspect tools before use; never use damaged or broken tools.
2. Use off-road forklift to move and position lengths of HDPE pipe.	a. Heavy equipment (physical injury, vehicular accidents)	i. Only certified operators may operate off-road forklift. ii. Operator will inspect off-road forklift daily before use, including check of safety equipment such as backup alarm and horn. iii. Operators will wear safety belt at all times when operating heavy equipment. iv. Operators will be alert for overhead lines, obstructions and ground personnel. v. Ground personnel will wear high visibility reflective safety vests.
	b. Noise	i. Heavy equipment operators required to wear hearing protection. ii. Ground personnel working near heavy equipment or the pipe fusion machine required to wear hearing protection.
3. Use chain saw to cut lengths of HDPE pipe.	a. Physical injury through contact with chain saw chain (lacerations, amputations, death)	i. Only qualified and trained personnel will operate chain saw. ii. Chain saw operator must wear leather gloves, full face shield and full leg chaps in addition to regular Level D PPE when operating chain saw. iii. Chain saw shall be equipped with a spark arrestor and full-functioning chain brake. iv. Do not operate chain saw when fatigued. v. Saw shall be placed on level ground with guide bar and chain off the ground

		when starting the engine. **Under no circumstances will a chain saw be drop-started.** vi. Chain shall not rotate at idle with the chain brake off. vii. Saw will be used between waist and mid-chest level only.
	b. Saw kickback	i. Do not attempt to cut material that is larger than the guide bar of the saw. ii. Avoid cuts that may cause the chain to jam. iii. The work area will be cleared of unnecessary personnel. iv. Maintain full throttle when cutting. v. Do not operate the chain saw when fatigued.
	c. Entanglement of clothing in chain saw	i. Tuck in shirt and pant legs. ii. Do not wear excessively loose fitting clothing. iii. Chain saw operator must wear leather gloves, full face shield and full leg chaps in addition to regular Level D PPE when operating saw.
	d. Fire hazard	i. A fire extinguisher must be kept close by when cutting in thick woods or brushy areas. ii. Chain saw fuel shall be stored and transported in an approved safety container. iii. Engine must be shut off and allowed to cool before refueling. iv. Keep fire extinguisher close by when refueling. v. Keep refueling area neat and free of combustible materials. vi. Do not smoke when fueling saw. vii. Use a funnel or can with a flexible nozzle when refueling to avoid spills.
	e. Slips, trips, falls	i. Inspect work area and remove any trip hazards before starting saw. ii. Practice good housekeeping; keep the work area neat. iii. Personnel will wear steel toe boots with non-skid soles.
	f. Noise	i. Personnel operating chain saw and ground personnel working nearby must wear hearing protection.
4. Use Gheen fittings to connect lengths of HDPE pipe and install fittings.	a. Pinch points, cuts, abrasions	i. Personnel will wear hand protection as needed to protect hands from cuts and abrasions. ii. Personnel will keep hands clear of clamps and verbally warn others before closing a clamp.

Equipment List equipment to be used in this work activity.	**Inspections** List required inspections for this work activity.	**Training** List required training for personnel performing this
1. Hand tools 2. Power tools 3. Off-road forklift 5. Chain saw 6. PPE – Hard hat – Safety glasses – Face shield (chain saw operator only) – Minimum 4" shirt sleeve and long pants – High-visibility safety vest with reflective tape – Heavy work gloves – Full-leg chain saw chaps (chain saw operator only) – Steel toe boots with non-skid soles – Hearing protection – (After dredging has begun, Tyvek coveralls and nitrile gloves will also be required.)	1. Inspect heavy equipment daily, including check of the backup alarm and horn. 2. Inspect work area and remove and trip hazards. 3. Inspect hand and power tools for excessive wear and damage before use; never use broken or damaged tools. 4. Inspect all electrical cords for damage and wear before use; never use damaged or worn cords. 5. Inspect pipe fusion machine daily before use.	1. Only certified operators will operate heavy equipment. 2. Pre-entry briefing prior to beginning work on site 3. 40-hour HAZWOPER training 4. Daily pre-task safety meeting

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	**Signature:**	**Date / time:**
IAI Site Superintendent:	Brent Cardwell		
Site Safety & Health Officer:			
Employees:			

Employees:	**Printed name:**	**Signature:**	**Date / time:**

AHA-05: Deploy Geotextile Tubes

Description of Task: Geotextile tubes will be used to dewater the dredged sediment. From the dredge, sediment will flow through the HDPE geotextile tube header system and into the geotextile tubes. Tubes will be filled in the dewatering pad. To deploy geotextile tubes, operations crews will take rolled up tubes and deploy them in the dewatering pad and pipe connections from the header system to each individual tube.	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Amber Wilson [redacted]
	IAI Site Super: Brent Cardwell, [redacted]	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
1. Use rigging to suspend a rolled up geotextile tube from the forks of an off-road forklift. Use the forklift to deliver the rolled up geotextile tube to the dewatering pad.	a. Rigging	i. Inspect rigging before use. ii. Never use rigging that is damaged or excessively worn. iii. Do not use rigging in excess of its recommended load. iv. Attach rigging to the load at designated pick points.
	b. Pinch points	i. Let heavy equipment do the work; slide forks under materials instead of sliding materials onto forks, etc. ii. Verbally and physically point out pinch points to other personnel as you work. iii. Keep hands and feet clear and stand back as the tube is being lifted. vii. Wear heavy work gloves to protect hands and steel toe boots to protect toes.
	c. Elevated loads	i. Never work under an elevated loads, extended booms, forks or buckets. ii. Use taglines to guide the tube as needed. iii. Remove all unnecessary personnel from the area. iv. Ensure the tube is properly secured to the forks before it is lifted.
	d. Physical injury/struck-by	i. Conduct a pre-task safety meeting to inform personnel working in the area of: what you will be moving, where you are moving it to and what route you will take. ii. Remove all unnecessary personnel from the area. iii. All personnel on site must wear high visibility safety vests with reflective tape to increase their visibility. iv. Use a designated signal person to direct the movements of the forklift in tight areas, areas of limited visibility, or if the load obstructs visibility. v. Use the lights and horn as needed to warn personnel of the forklift's approach.

	e. Noise	i. The forklift operator must wear hearing protection. ii. Any ground personnel working in the area may also require hearing protection, if they will be exposed to excessive noise for longer than a few minutes or greater than 85 decibels based on 8 hour time weighted average. iii. When personnel are wearing hearing protection, hand signals must be used to effectively communicate. Hand signals are to be reviewed in the pre-task safety meeting. One person must be the designated signal person for the forklift operator.
2. Use geotextile tube straps to attach the end of the tube to an utility vehicle. Slowly drive the utility vehicle forward, unrolling the tube as the utility vehicle moves forward.	a. Physical injury/struck by	i. Proceed slowly when unrolling the tube with the utility vehicle. Clear personnel away from the tube and the utility vehicle. ii. Ensure the utility vehicle operator is familiar and experienced with the safe operation of the utility vehicle as per operator's manual.
	b. Elevated load	i. Do not stand under the rolled up tube or the forks of the forklift.
3. Crew members work together to slide unrolled tube into place and unfold the sides.	a. Overexertion, back strain, heat stress	i. Let the forklift and utility vehicle do as much of the work as possible. ii. Get enough sleep at night; when you are well rested, you are less likely to be affected by heat stress and less likely to overexert yourself. iii. Do not bend or twist your back when lifting or pulling. Turn your feet in the direction you want to go. iv. Keeping your back straight, pull the load in close to your body, keeping it between your knees and shoulders. v. Don't try to lift or pull more weight than you can comfortably handle; work as a team to get the job done. Team lift loads greater than 50 pounds or let equipment do the work. vi. Whenever possible, schedule heavy work for coolest parts of the day. vii. Take water/rest breaks as needed; more frequent breaks are needed during warm weather.
	b. Ramps, catwalks (if used)	i. A competent person, as designated by the Site Safety & Health Officer, will direct the placement and set up of the ramps and catwalks. ii. Install ramps and catwalks according to manufacturer's recommendations, including the use and placement of guy wires, ties and bracing. iii. Ensure ramps and catwalks bear on adequate firm foundation. iv. Position ramps and catwalks so that the base to height ratio is no more than

		1:3 (20 degrees of slope). v. Keep walking surfaces clean and clear of debris, sediment, standing water. vi. Do not load ramps and catwalks beyond their rated capacity; use them only for the purpose for which they were designed.
	c. Working at elevations	i. When deploying a stacked tube, personnel will be standing on top of a filled geotextile tube, 7 – 8.5 ft in height. Personnel must not stand or work within 10 feet of the edge of the top surface of the tube. ii. Flags will be placed along the length of the top surface of filled tubes, 10 feet from the edge, to warn personnel of the danger.
	d. Slips/trips/falls	i. Personnel must wear waterproof steel toe boots with non-skid soles on site. ii. Personnel must not work beyond the flags placed along the top surface of filled tubes. iii. Personnel must access the stacked tubes using ramps and catwalks installed for this purpose. Personnel must never attempt to climb up the side of the tubes; wet tubes are very slippery. iv. Place hoses as close to the centerline of the tubes as possible, to provide at least a 10 ft wide walking lane on either side.
	e. Exposure to contaminated sediment, geotextile tube filtrate	i. Personnel must wear chemical resistant coveralls (such as Tyvek) and two layers of nitrile gloves, sealed to the coveralls with tape, to protect skin from contacting contaminated sediment and/or geotextile tube filtrate. ii. Personnel must also wear a face shield if there is risk of sediment or geotextile tube filtrate splashing above the knee level. iii. Decontamination of personnel as required at the decontamination station.
4. Secure the tube in place, then connect the tube to the header system using thick rubber hose, lay flat hose and HDPE stingers.	a. Hand, power tools	i. Inspect tools before use. Never use broken or damaged tools.
	b. Damage to the geotextile fabric	i. Take care not to snag, rip or tear the geotextile fabric with tools. (If geotextile tube fabric is damaged, stop flow to the tube immediately. Have an experienced geotextile tube operator or shift supervisor inspect the tube before placing it back into service. Repairs will only be made under the direction of the geotextile tube manufacturer.) ii. Place felt or similar protective material around sharp metal edges such as bolts or wrap with duct tape, to prevent the sharp edges from wearing or

		puncturing the geotextile fabric.

Equipment List equipment to be used in this work activity.	**Inspections** List required inspections for this work activity.	**Training** List required training for personnel performing this
1. PPE – Hard hat – Safety glasses – Face shield, if risk of sediment or geotextile tube filtrate splashing above knee level – Minimum 4" shirt sleeve and long pants – Chemical resistant coveralls (such as Tyvek) sealed to gloves and boots with duct tape – High-visibility safety vest with reflective tape – Double layer of nitrile gloves – Waterproof steel toe boots with non-skid soles – Hearing protection as needed	1. Geotextile tubes must be carefully inspected prior to and during deployment to ensure there are no rips, tears, seam separations or weakened areas in the woven fabric. 2. Inspect pipelines for leaks daily. 3. Rigging must be inspected by a qualified person before use.	1. Pre-entry briefing prior to beginning work on site 2. 40-hour HAZWOPER training 3. Daily pre-task safety meeting 4. On the job training: personnel must learn about the special hazards associated with geotextile tube operation from other more experienced crew members

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	**Signature:**	**Date / time:**
IAI Site Superintendent:	Brent Cardwell		
Site Safety & Health Officer:			
Employees:			

AHA-06: Operate Geotextile Tubes

Description of Task: Geotextile tubes will be used to dewater the dredged sediment. From the dredge, sediment will flow through the HDPE geotextile tube header system and into the geotextile tubes. Tubes will eventually be filled in the dewatering pad.	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Amber Wilson [redacted]
	IAI Site Super: Brent Cardwell, [redacted]	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
1. Turn pinch valves to start or stop flow into a geotextile tube or group of geotextile tubes.	a. Back strain, overexertion	i. Don't twist your back as you turn the valve. Reposition your hands as needed. ii. Open flow to a dewatered tube (or group of tubes) before attempting to stop flow to a tube (or group of tubes).
	b. Heat stress	i. Whenever possible, schedule the heaviest work for the coolest parts of the day (early morning and evening). ii. Take water/rest breaks as needed; more frequent breaks are needed during hot weather. iii. Take breaks in the shade. iv. Wear lightweight cotton clothing under PPE. v. Use cooling hard hat inserts and/or cooling vests to prevent heat related illness. vi. Avoid caffeine and alcohol (on off-hours) which dehydrate the body. vii. Get enough rest, which will help your body cope with heat stress. viii. Take a drink of cool water or electrolyte-replacing sports drinks frequently whenever you are sweating. Don't wait until you feel thirsty; that is a late signal of dehydration.
2. Measure geotextile tube height utilizing a low power laser level (or measuring rod) and inspect geotextile tubes for seam separations, rips, tears, signs of weakening.	a. Ramps, catwalks (if used)	i. A competent person, as designated by the Site Safety & Health Officer, will direct the placement and set up of the ramps and catwalks. ii. Install ramps and catwalks according to manufacturer's recommendations, including the use and placement of guy wires, ties and bracing. iii. Ensure ramps and catwalks bear on adequate firm foundation. iv. Position ramps and catwalks so that the base to height ratio is no more than 1:3 (20 degrees of slope).

		v. Keep walking surfaces clean and clear of debris, sediment, standing water. vi. Do not load ramps and catwalks beyond their rated capacity; use them only for the purpose for which they were designed.
	b. Working at elevations, slips/trips/falls	i. Personnel must not stand or work within 10 feet of the edge of the top surface of the tube. ii. Flags will be placed along the length of the top surface of filled tubes, 10 feet from the edge, to warn personnel of the danger. iii. Personnel must wear waterproof steel toe boots with non-skid soles on site. iv. Personnel must access the stacked tubes using ramps and catwalks installed for this purpose. Personnel must never attempt to climb up the side of the tubes; wet tubes are very slippery. v. Place hoses as close to the centerline of the tubes as possible, to provide at least a 10 ft wide walking lane on either side.
	c. Laser use (if used)	i. Do not look directly into the laser light.
	d. Engulfment	i. Never fill a geotextile tube beyond its maximum rated fill height. ii. As geotextile tubes fill with dewatered sediment, the length of time it takes for the tube to reach maximum fill height decreases dramatically. When tubes are being "topped off," the operator must remain attentive to ensure the tube is not overfilled. iii. If a tube shows signs of weakening, is suddenly "rounder," or is making creaking sounds, immediately start flow to other fresh tubes, stop flow to the suspect tube and clear personnel from the area.
3. Manually stimulate the geotextile fabric to encourage weep water release.	a. Overexertion, heat stress	i. Gently stimulate the geotextile fabric to encourage weep water release. Take care not to puncture or weaken the fabric. ii. Take water/rest breaks out of the sun. More frequent breaks are needed in hot weather. iii. Use cooling hard hat inserts or vests to stay cool. iv. Drink frequently to replace fluids lost through sweating. v. Avoid caffeine and alcohol (on off hours) which dehydrate the body. vi. Get enough sleep at night; if you are well rested, you are better able to cope with heat stress and less likely to overexert yourself.
	b. Engulfment	i. Stimulate the fabric carefully using blunt materials: Puncturing or weakening the geotextile fabric of a tube could result in it rupturing. If you are standing

		on a tube or near a tube when it ruptures, you are in very great danger of being engulfed by the sudden flow of water and sediment that will be released.
	c. Exposure to contaminated geotextile tube filtrate	i. Personnel must wear a face shield when manually stimulating the geotextile tube fabric.
4. Collect a sediment sample and observe flocculation.	a. Exposure to contaminated sediment, polymer	i. Personnel must wear a face shield whenever there is risk of sediment or polymer splashing above knee level. ii. Personnel must wear chemical resistant coveralls (such as Tyvek) and two layers of nitrile gloves, sealed to coveralls, when working in the dewatering pad.

Equipment List equipment to be used in this work activity.	**Inspections** List required inspections for this work activity.	**Training** List required training for personnel performing this
1. Laser level or measuring rod 2. Sample pail 3. Brooms or smooth lengths of pipe (no sharp or rough edges) 4. PPE – Hard hat – Safety glasses – Face shield, if risk of sediment or geotextile tube filtrate splashing – Minimum 4” shirt sleeve and long pants – Chemical resistant coveralls (such as Tyvek) sealed to gloves and boots with duct tape – High-visibility safety vest with reflective tape – Double layer of nitrile gloves – Waterproof steel toe boots with non-skid soles – Hearing protection as needed	1. Geotextile tubes must be carefully inspected continuously during filling operations to ensure there are no rips, tears, seam separations or weakened areas in the woven fabric. 2. Geotextile tubes that are being filled must remain in the line of site of the operator at all times, to ensure the tubes are not overfilled, which can cause them to rupture. For the same reason, tubes must be measured frequently. 3. Inspect pipelines for leaks daily.	1. Pre-entry briefing prior to beginning work on site 2. 40-hour HAZWOPER training 3. Daily pre-task safety meeting 4. On the job training: personnel must learn about the special hazards associated with geotextile tube operation from other more experienced crew members

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	**Signature:**	**Date / time:**
IAI Site Superintendent:	Brent Cardwell		

Site Safety & Health Officer:			
Employees:			
Employees:	**Printed name:**	**Signature:**	**Date / time:**

7.0 PERSONAL PROTECTIVE EQUIPMENT

The Site Safety & Health Officer (SSHO) will establish appropriate levels of PPE for each work activity based on review of historical site information, existing data, and an evaluation of the potential for exposure during each task. The following table provides a summary of the PPE requirements for IAI personnel.

Table 2: Required PPE for IAI Personnel by Work Task

Task(s)	Body	Head	Hand	Foot	Respiratory
Operate off road forklift (outside of dewatering pad) Unload equipment & materials (outside of dewatering pad) Use hand & power tools (outside of dewatering pad)	High vis safety vest Long pants Minimum 4" shirt sleeve	Hard hat Safety glasses Hearing protection as needed	Work gloves as needed	Steel toe boots with non-skid soles	None
Construct HDPE geotextile tube header system	High vis safety vest Long pants Chain saw chaps Minimum 4" shirt sleeve	Hard hat Safety glasses Face shield Hearing protection	Work gloves	Steel toe boots with non-skid soles	None
Deploy geotextile tubes Operate and maintain geotextile tubes	Long pants Minimum 4" shirt sleeve Tyvek coveralls High vis safety vest	Hard hat Safety glasses Face shield, if risk of polymer, sediment or filtrate splashing Hearing protection as needed	Double layer of nitrile gloves, sealed to coveralls with duct tape	Waterproof steel toe boots with non-skid soles, sealed to coveralls with duct tape	None
Upgrade PPE when: 1. An individual performing tasks requests it, 2. There is a change in work tasks that will increase contact or potential contact with hazardous materials, 3. Gas or vapor emission occurs or is likely to occur, 4. There is a known or suspected presence of dermal hazards, or 5. Action levels are exceeded			**Downgrade PPE when:** 1. New information indicating that situation is less hazardous than originally thought is revealed, 2. There is a change in site conditions that decrease the hazard, or 3. There is a change in work task that will reduce contact with hazardous materials		

AHA 3
Treatment and Discharge of Dredged Water

Clean Harbors Environmental Services
11800 Stony Island
Chicago, IL 60617
(773) *646-6202*

Clean Harbors will be assembling and operating a water treatment plant to manage the water from sediment dewatering activities.

The water will be decanted from the geotextile dewatering pad using a sump and pump. Water will enter the treatment system where it will pass through oil grabbing bags, organo-clay units, and granulated activated carbon treatment vessels. Treated water will be discharged into the river. Treated water will be sampled at regular intervals to ensure treatment is accomplished.

AHA-01: Forklift/Boom Trucks Operations

Description of Task: Forklifts/Boom Trucks will be used to move materials (including but not limited to piping, hoses, GAC vessels, Filtration Media and Multi Filter Housings) around the site.	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Darrell Pierce, 231-258-8014
	CHES Site Super: Darrell Pierce, 231-258-8014	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
4. Inspect the forklift/Boom Truck daily prior to use; document the inspection by completing the inspection form.	c. Physical injury/struck-by	iii. Conduct the inspection in a safe area, away from foot and other vehicle traffic. iv. Notify other personnel working in the area that you will be conducting the inspection, especially if they are wearing hearing protection and may not hear the forklift's engine noise.
5. Use rigging as needed (for example, if the load is not skid mounted) to attach the load to the forks of the forklift.	b. Rigging	i. Inspect rigging before use. ii. Never use rigging that is damaged or excessively worn. iii. Do not use rigging in excess of its recommended load. iv. Attach rigging to the load at designated pick points.
	d. Pinch points	i. Let heavy equipment do the work; slide forks under materials instead of sliding materials onto forks, etc. ii. Verbally and physically point out pinch points to other personnel as you work. iii. Keep hands and feet clear and stand back as materials are being lifted off truck or trailer. iv. Wear heavy work gloves to protect hands and steel toe boots to protect toes.
6. Use the forklift/boom truck to move materials/equipment around the site.	c. Physical injury/struck-by	i. Conduct a pre-task safety meeting to inform personnel working in the area of: what you will be moving, where you are moving it to and what route you will take. ii. Remove all unnecessary personnel from the area.

AHA-01: Forklift/Boom Trucks Operations

		iii. All personnel on site must wear chartreuse or orange safety vests with reflective tape to increase their visibility. iv. Use a designated signal person to direct the movements of the forklift in tight areas. v. Use the lights and horn as needed to warn personnel of the forklift's approach.
	c. Elevated loads	i. Never work under loads, extended booms, forks or buckets. ii. Use taglines to guide load. iii. Remove unnecessary personnel from the area. iv. Ensure load is properly secured before it is lifted.
	d. Noise	iii. The forklift operator must wear hearing protection. iv. Any ground personnel working in the area may also require hearing protection, if they will be exposed to excessive noise for longer than a few minutes or 85 decibels based on 8 hour time weighted average.

Equipment List equipment to be used in this work activity	**Inspections** List required inspections for this work activity	**Training** List required training for personnel performing this
4. Forklift/Boom Truck 5. Rigging 6. Level D PPE – Hard hat – Safety glasses – 4" minimum shirt sleeve and long pants – High-visibility reflective safety vest – Work gloves – Waterproof steel toe boots with non-skid soles – Hearing protection	4. Inspect forklift/Boom truck daily before use, including a check of the backup alarm and horn. 5. Rigging must be inspected before every use. Check for fraying, wear and damage. Frayed, worn or damaged rigging will not be used. 6. Make sure the rigging to be used is adequate for the load.	5. Operators must have forklift training, with training documented and on file at the site. 6. Pre-entry briefing prior to beginning work on site 7. Pre-task safety meeting 8. 40-hour HAZWOPER training

AHA-01: Forklift/Boom Trucks Operations

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	Signature:	Date / time:
CHES Site Superintendent:	Darrell Pierce		
Site Safety & Health Officer:			
Employees:			

Employees:	Printed name:	Signature:	Date / time:

AHA-01: Forklift/Boom Trucks Operations

AHA-02: Unload Equipment & Materials Delivered to the Site

Description of Task: Equipment and materials such as (including but not limited to piping, hoses, GAC vessels, Filtration Media and Multi Filter Housings) will be delivered to the site on flat-bed trucks. Items in excess of 50 lbs. will be unloaded using an off-road forklift, or if very large, a crane. Items less than 50 lbs. may be unloaded manually.	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Darrell Pierce, 231-258-8014
	CHES Site Super: Darrell Pierce, 231-258-8014	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
4. Equipment and materials are delivered to site by truck.	b. Large vehicles moving around site (struck by, vehicular accidents)	i. Designated personnel will be positioned to signal truck and control other traffic. ii. Personnel will wear a high visibility reflective safety vest. iii. Ground personnel will not approach a vehicle without the operator's permission.
5. Access bed of delivery truck.	b. Slips, trips, falls	i. Personnel will access the trailer at designated access points (trailer steps) or use a step ladder. ii. Limit the number of personnel on the trailer to only those necessary.
6. Drive or position forklift/boom truck up to trailer; use rigging to secure equipment or materials in excess of 50 lbs. to the forks of the forklift.	f. Rigging	i. Inspect rigging before use. ii. Never use rigging that is damaged or excessively worn. iii. Do not use rigging in excess of its recommended load. iv. Attach rigging to designated pick points.
	g. Pinch points	i. Let heavy equipment do the work; slide forks under materials instead of sliding materials onto forks, etc. ii. Verbally and physically point out pinch points to other personnel as you work. iii. Keep hands and feet clear and stand back as materials are being lifted off truck or trailer. iv. Wear heavy work gloves to protect hands and steel toe boots to protect toes.

AHA-02: Unload Equipment & Materials Delivered to the Site

	h. Noise	iii. Hearing protection is required.
	i. Exposure to diesel exhaust	ii. Avoid inhaling diesel exhaust; if someone inhales large amounts of exhaust, immediately remove them to fresh air. Provide artificial respiration if breathing has stopped. Get immediate medical attention.
	j. Physical injury (struck by heavy equipment)	i. Only certified operators may operate off-road forklift. ii. Operator will inspect off-road forklift daily before use, including check of safety equipment such as backup alarm and horn. iii. Operators will wear safety belt at all times when operating heavy equipment. iv. Operators will be alert for overhead lines, obstructions and ground personnel. v. Ground personnel will wear high visibility reflective safety vests.
5. Use forklift/Boom Truck to lift equipment or materials off truck and place in designated staging area.	b. Physical injury (struck by, caught between)	viii. One person will be designated signal person. This person must remain in sight of the off-road forklift operator at all times. ix. Entire crew will review hand signals before beginning operation. x. Review sequence of work with entire crew before beginning task. xi. Clear area of all unnecessary personnel. xii. Ground personnel will not approach off-road forklift without the operator's permission. xiii. Ground personnel will wear hard hat and high visibility reflective safety vest. xiv. Ground personnel will not walk between moving vehicles and stationary points.
	c. Elevated loads	v. Never work under loads, extended booms, forks or buckets. vi. Use taglines to guide load. vii. Remove unnecessary personnel from the area. viii. Ensure load is properly secured before it is lifted.
6. Manually unload smaller/lighter equipment or materials that cannot be unloaded with the off-road forklift.	d. Physical injury (back strain, pinched fingers or toes)	vi. Practice safe lifting techniques, such as: – Bend at the knees, keeping your back straight. – Turn with your feet; don't twist your body.

AHA-02: Unload Equipment & Materials Delivered to the Site

		– Keep the load close to your body, between your knees and shoulders. vii. Wear heavy work gloves to protect hands and steel toe boots to protect toes. viii. Pick up items in the way they were designed to be picked up (using handles, etc.) ix. Work with a buddy. x. Use off-road forklift to unload heavy items as much as possible.
	e. Overexertion	iii. Work in pairs to lift anything in excess of 50 lbs. iv. Take rest breaks as needed. Rest more frequently the first few days on the job to acclimatize yourself.
	f. Heat stress	v. Drink cool water every 20 minutes when working in a hot environment. vi. Take water/rest breaks as needed. Rest more frequently the first few days on the job to acclimatize yourself. vii. Do heavy work during coolest part of the day. viii. Observe personnel for symptoms of heat-related illnesses, including: confusion, irrational behavior, fainting, hot, dry skin (lack of sweating), convulsions, headache, nausea, vertigo, thirst, weakness

Equipment List equipment to be used in this work activity	**Inspections** List required inspections for this work activity	**Training** List required training for personnel performing this
1. Forklift/Boom Truck 4. Rigging 5. Level D PPE – Hard hat – Safety glasses – 4” minimum shirt sleeve and long pants – High-visibility reflective safety vest – Work gloves – Waterproof steel toe boots with non-skid soles – Hearing protection	4. Inspect off-road forklift/Boom Truck daily before use, including a check of the backup alarm and horn. 5. Rigging must be inspected before every use. Check for fraying, wear and damage. Frayed, worn or damaged rigging will not be used. 6. Make sure the rigging to be used is adequate for the load.	5. Operators must have forklift training, with training documented and on file at the site. 6. Pre-entry briefing prior to beginning work on site 7. Pre-task safety meeting 8. 40-hour HAZWOPER training

AHA-02: Unload Equipment & Materials Delivered to the Site

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	Signature:	Date / time:
CHES Site Superintendent:	Darrell Pierce		
Site Safety & Health Officer:			
Employees:			
Employees:	**Printed name:**	**Signature:**	**Date / time:**

AHA-02: Unload Equipment & Materials Delivered to the Site

AHA-03: Use Hand & Power Tools

Description of Task: Hand and power tools will be used frequently on site for a variety of tasks, including construction and maintenance.	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Darrell Pierce, 231-258-8014
	CHES Site Super: Darrell Pierce, 231-258-8014	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
3. Use hand and power tools	b. Exposure to electricity	v. Inspect electrical cords for damage or excessive wear before use. Do not use tools with damaged or worn cords. vi. Use Ground Fault Circuit Interrupters (GFI) when using electrical power tools in wet areas. vii. Use extension cords and other electrical equipment specifically designed for marine use when working in wet areas.
	c. Physical injury (cuts, abrasions)	v. Tuck in loose clothing, tie back hair and keep hands away from moving power tool parts. vi. Personnel will wear work gloves to protect hands when using hand or power tools unless the loss of dexterity poses a greater hazard. vii. Use the proper tool for the job; do not use tools for a task that they were not designed. viii. Inspect tools before use; never use damaged or broken tools.

Equipment List equipment to be used in this work activity	**Inspections** List required inspections for this work activity	**Training** List required training for personnel performing this
2. Tools 2 Level D PPE – Hard hat – Safety glasses – 4” minimum shirt sleeve and long pants	2. Inspect all tools before use. Never use tools that are excessively worn or damaged	5. Before using a power tool that they’ve never used before, personnel must receive instructions about how to safely operate the tool or review the O&M manual. 6. Pre-entry briefing prior to beginning work on site

AHA-03: Use Hand & Power Tools

– High-visibility reflective safety vest – Work gloves – Waterproof steel toe boots with non-skid soles – Hearing protection		7. Pre-task safety meeting 8. 40-hour HAZWOPER training

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	Signature:	Date / time:
CHES Site Superintendent:	Darrell Pierce		
Site Safety & Health Officer:			
Employees:			

AHA-03: Use Hand & Power Tools

AHA-04: Installation of the Water Filtration System

Description of Task: Installation of the Water Filtration System.	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Darrell Pierce, 231-258-8014
	IAI Site Super: Darrell Pierce, 231-258-8014	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
5. Use hand and power tools.	b. Electrical hazards	ii. Inspect electrical cords for damage or excessive wear before use.
	c. Physical injury (cuts, abrasions)	i. Stay clear of moving parts. ii. Personnel will wear heavy canvas or leather work gloves to protect hands when using hand or power tools. iii. Use the proper tool for the job. iv. Inspect tools before use; never use damaged or broken tools.
1. Use off-road forklift/Boom Truck to move and install filtration system.	b. Heavy equipment (physical injury, vehicular accidents)	i. Only certified operators may operate off-road forklift. ii. Operator will inspect off-road forklift daily before use, including check of safety equipment such as backup alarm and horn. iii. Operators will wear safety belt at all times when operating heavy equipment. iv. Operators will be alert for overhead lines, obstructions and ground personnel. v. Ground personnel will wear high visibility reflective safety vests.
	c. Noise	iii. Heavy equipment operators required to wear hearing protection. iv. Ground personnel working near heavy equipment or the pipe fusion machine required to wear hearing protection.
	c. Overexertion	i. Work in pairs to lift anything in excess of 50 lbs. ii. Take rest breaks as needed. Rest more frequently the first few days on the job to acclimate yourself.
	d. Heat stress	iii. Drink cool water every 20 minutes when working in a hot environment.

AHA-04: Installation of the Water Filtration System

		iv. Take water/rest breaks as needed. Rest more frequently the first few days on the job to acclimatize yourself. v. Do heavy work during coolest part of the day. vi. Observe personnel for symptoms of heat-related illnesses, including: confusion, irrational behavior, fainting, hot, dry skin (lack of sweating), convulsions, headache, nausea, vertigo, thirst, weakness

Equipment List equipment to be used in this work activity.	**Inspections** List required inspections for this work activity.	**Training** List required training for personnel performing this work
4. Hand tools 5. Power tools 6. Forklift/Boom Truck 7. PPE – Hard hat – Safety glasses – Minimum 4" shirt sleeve and long pants – High-visibility safety vest with reflective tape – Heavy work gloves – Steel toe boots with non-skid soles – Hearing protection	6. Inspect heavy equipment daily, including check of the backup alarm and horn. 7. Inspect work area and remove and trip hazards. 8. Inspect hand and power tools for excessive wear and damage before use; never use broken or damaged tools. 9. Inspect all electrical cords for damage and wear before use; never use damaged or worn cords.	5. Only certified operators will operate heavy equipment. 6. Pre-entry briefing prior to beginning work on site 7. 40-hour HAZWOPER training 8. Daily pre-task safety meeting

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	**Signature:**	**Date / time:**
CHES Site Superintendent:	Darrell Pierce		
Site Safety & Health Officer:			

AHA-04: Installation of the Water Filtration System

Employees:			
Employees:	**Printed name:**	**Signature:**	**Date / time:**

AHA-04: Installation of the Water Filtration System

AHA-05: Operation of Water Filtration System

Description of Task: Transfer pump will pick up water from the sump and push it thru multi oil grabbing bag filters, Organo Clay media and then thru dual stage carbon beds	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Darrell Pierce 231-258-8014
	CHES Site Super: Darrell Pierce 231-258-8014	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
5. Transfer pump will pick up water from the sump and push it thru multi oil grabbing bag filters, Organo Clay media and then thru dual stage carbon beds	f. Rigging	v. Inspect rigging before use. vi. Never use rigging that is damaged or excessively worn. vii. Do not use rigging in excess of its recommended load. viii. Attach rigging to the load at designated pick points.
	g. Pinch points	iv. Let heavy equipment do the work; slide forks under materials instead of sliding materials onto forks, etc. v. Verbally and physically point out pinch points to other personnel as you work. vi. Keep hands and feet clear and stand back as the tube is being lifted. viii. Wear heavy work gloves to protect hands and steel toe boots to protect toes.
	h. Elevated loads	v. Never work under an elevated loads, extended booms, forks or buckets. vi. Use taglines to guide the tube as needed. vii. Remove all unnecessary personnel from the area. viii. Ensure the tube is properly secured to the forks before it is lifted.
	i. Physical injury/struck-by	vi. Conduct a pre-task safety meeting to inform personnel working in the area of: what you will be moving, where you are moving it to and what route you will take. vii. Remove all unnecessary personnel from the area. viii. All personnel on site must wear high visibility safety vests with reflective tape

AHA-05: Operation of Water Filtration System

		to increase their visibility. ix. Use a designated signal person to direct the movements of the forklift in tight areas. x. Use the lights and horn as needed to warn personnel of the forklift's approach.
	j. Noise	iv. The pump operator must wear hearing protection. v. Any ground personnel working in the area may also require hearing protection, if they will be exposed to excessive noise for longer than a few minutes. vi. When personnel are wearing hearing protection, hand signals must be used to effectively communicate. Hand signals are to be reviewed in the pre-task safety meeting. One person must be the designated signal person for the fork lift/boom truck operator.
6. Multi Filter Housings	c. Pinch points	i. Verbally and physically point out pinch points to other personnel as you work. ii. Keep hands and feet clear and stand back as the bags are being lifted and replaced. iii. Wear heavy work gloves to protect hands and steel toe boots to protect toes.
7. Operation of System	f. Overexertion, back strain, heat stress	viii. Let your knees do as much of the lifting as possible. ix. Get enough sleep at night; when you are well rested, you are less likely to be affected by heat stress and less likely to overexert yourself. x. Do not bend or twist your back when lifting or pulling. Turn your feet in the direction you want to go. xi. Keeping your back straight, pull the load in close to your body, keeping it between your knees and shoulders. xii. Don't try to lift or pull more weight than you can comfortably handle; work as a team to get the job done. xiii. Whenever possible, schedule heavy work for coolest parts of the day. xiv. Take water/rest breaks as needed; more frequent breaks are needed during warm weather.

AHA-05: Operation of Water Filtration System

	g. Ramps, catwalks (if used)	vii. A competent person, as designated by the Site Safety & Health Officer, will direct the placement and set up of the ramps and catwalks. viii. Install ramps and catwalks according to manufacturer's recommendations, including the use and placement of guy wires, ties and bracing. ix. Ensure ramps and catwalks bear on adequate firm foundation. x. Position ramps and catwalks so that the base to height ratio is no more than 1:3 (20 degrees of slope). xi. Keep walking surfaces clean and clear of debris, sediment, standing water. xii. Do not load ramps and catwalks beyond their rated capacity; use them only for the purpose for which they were designed.
	h. Pressure Build up	iii. Keep a watch on pressure gauges and change out filter bags or media as warranted
	i. Slips/trips/falls	v. Personnel must wear waterproof steel toe boots with non-skid soles on site. vi. Personnel must not work beyond the flags placed along the top surface of filled tubes. vii. Personnel must access the stacked tubes using ramps and catwalks installed for this purpose. Personnel must never attempt to climb up the side of the tubes; wet tubes are very slippery. viii. Place hoses as close to the centerline of the vessels as possible, to provide at least a 10 ft wide walking lane on either side.
	j. Exposure to contaminated water	iv. Personnel must wear hard hat, safety glasses, work gloves and steel toe boots v. Personnel must also wear a face shield if there is risk of sediment or water splashing above the knee level.
8. Secure the hose and piping	c. Cam-lock fittings	ii. All cam-lock will be secured with a tie rap or wire
	d. Damage to the hoses	iii. Inspect daily for leaking and or damage hoses, replace as needed

Equipment	**Inspections**	**Training**
List equipment to be used in this work activity.	List required inspections for this work activity.	List required training for personnel performing this

AHA-05: Operation of Water Filtration System

2. PPE – Hard hat – Safety glasses – Face shield, if risk of sediment or water filtrate splashing above knee level – Minimum 4" shirt sleeve and long pants – High-visibility safety vest with reflective tape – Work gloves – Waterproof steel toe boots with non-skid soles – Hearing protection as needed	4. Treatment system must be carefully inspected prior to start-up & as well as during operation to ensure there are no leaks or pressure problems. 5. Inspect pipes/hoses for leaks daily.	5. Pre-entry briefing prior to beginning work on site 6. 40-hour HAZWOPER training 7. Daily pre-task safety meeting 8. On the job training: personnel must learn about the special hazards associated with operation from other more experienced crew members

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	**Signature:**	**Date / time:**
CHES Site Superintendent:	Darrell Pierce		
Site Safety & Health Officer:			
Employees:			

AHA-05: Operation of Water Filtration System

AHA-06: Filtration Media Change-out

Description of Task: Filter media removal and installation including oil grabbing filter bags	**Project:** Ceresco Dam Dredging Project	**Date of last revision:** 09/16/10
	Location: Ceresco, Michigan	**Analyzed by:** Darrell Pierce 231-258-8014
	CHES Site Super: Darrell Pierce 231-258-8014	**Review:** Annually, with revision

Principal Steps Identify principal steps and sequence of work.	**Potential Hazards** Analyze each principal step for potential hazards.	**Hazard Controls** List methods to eliminate or control hazards (safe work practices).
5. Stop or bypass the flow of water and drain multi filter housings and replace filter bags	c. Back strain, overexertion	iii. Don't twist your back as you remove bags. Reposition your hands & knees as needed. iv. Bypass system before attempting to stop flow to a filter housing
	d. Heat stress	i. Whenever possible, schedule the heaviest work for the coolest parts of the day (early morning and evening). ii. Take water/rest breaks as needed; more frequent breaks are needed during hot weather. iii. Take breaks in the shade. iv. Wear lightweight cotton clothing under PPE. v. Use cooling hard hat inserts and/or cooling vests to prevent heat related illness. vi. Avoid caffeine and alcohol (on off-hours) which dehydrate the body. vii. Get enough rest, which will help your body cope with heat stress. viii. Take a drink of cool water or electrolyte-replacing sports drinks frequently whenever you are sweating. Don't wait until you feel thirsty; that is a late signal of dehydration.
6. Media Removal (Vac Truck)	e. Ramps, catwalks (if used)	i. A competent person, as designated by the Site Safety & Health Officer, will direct the placement and set up of the ramps and catwalks. ii. Install ramps and catwalks according to manufacturer's recommendations, including the use and placement of guy wires, ties and

AHA-06: Filtration Media Change-out

		bracing. iii. Ensure ramps and catwalks bear on adequate firm foundation. iv. Position ramps and catwalks so that the base to height ratio is no more than 1:3 (20 degrees of slope). v. Keep walking surfaces clean and clear of debris, sediment, standing water. vi. Do not load ramps and catwalks beyond their rated capacity; use them only for the purpose for which they were designed.
	f. Working at elevations, slips/trips/falls	i. Personnel must not stand or work on top of vessels without being layard/tied off. ii. Personal must wear hard hat and safety glasses at all time iii. Personnel must wear waterproof steel toe boots with non-skid soles on site.
	g. Exposure to contaminated media	i. Personnel must wear a face shield & safety glasses when working the Vac truck hose on top of the vessels
	h. Vacuum trucks moving around site (struck by, vehicular accidents)	ii. Designated personnel will be positioned to signal truck and control other traffic. iii. Personnel will wear a high visibility reflective safety vest. iv. Ground personnel will not approach a vehicle without the operator's permission.
3. Media Installation	d. Ramps, catwalks (if used)	i. A competent person, as designated by the Site Safety & Health Officer, will direct the placement and set up of the ramps and catwalks. ii. Install ramps and catwalks according to manufacturer's recommendations, including the use and placement of guy wires, ties and bracing. iii. Ensure ramps and catwalks bear on adequate firm foundation. iv. Position ramps and catwalks so that the base to height ratio is no more than 1:3 (20 degrees of slope).

AHA-06: Filtration Media Change-out

		v. Keep walking surfaces clean and clear of debris, sediment, standing water. vi. Do not load ramps and catwalks beyond their rated capacity; use them only for the purpose for which they were designed.
	e. Fork Lift/Boom Truck	i. 7 Designated personnel will be positioned to signal truck and control other traffic. ii. 8 Personnel will wear a high visibility reflective safety vest. iii. 9 Ground personnel will not approach a vehicle without the operator's permission.
	f. Working at elevations, slips/trips/falls	i. Personnel must not stand or work on top of vessels without being layard/tied off. ii. Personal must wear hard hat and safety glasses at all time iii. Personnel must wear waterproof steel toe boots with non-skid soles on site.

Equipment List equipment to be used in this work activity.	**Inspections** List required inspections for this work activity.	**Training** List required training for personnel performing this
5. Boom truck 6. Vacuum Truck 7. Hand Tools 8. PPE – Hard hat – Safety glasses – Face shield, if risk of sediment or water – Minimum 4" shirt sleeve and long pants	1 Inspect trucks and equipment daily before use, including a check of the backup alarm and horn. 2 Rigging must be inspected before every use. Check for fraying, wear and damage. Frayed, worn or damaged rigging will not be used. 3 Inspect all tools before use. Never use tools that are excessively worn or damaged	5. Pre-entry briefing prior to beginning work on site 6. 40-hour HAZWOPER training 7. Daily pre-task safety meeting 8. On the job training: personnel must learn about the special hazards associated with water filtration operation from other more experienced crew members

AHA-06: Filtration Media Change-out

– High-visibility safety vest with reflective tape – Waterproof steel toe boots with non-skid soles – Hearing protection as needed		

Acknowledgement of Training *(Attach additional sheets for signatures, as needed.)*

	Printed name:	Signature:	Date / time:
CHES Site Superintendent:	Darrell Pierce		
Site Safety & Health Officer:			
Employees:			
Employees:	**Printed name:**	**Signature:**	**Date / time:**

AHA-06: Filtration Media Change-out

PERSONAL PROTECTIVE EQUIPMENT

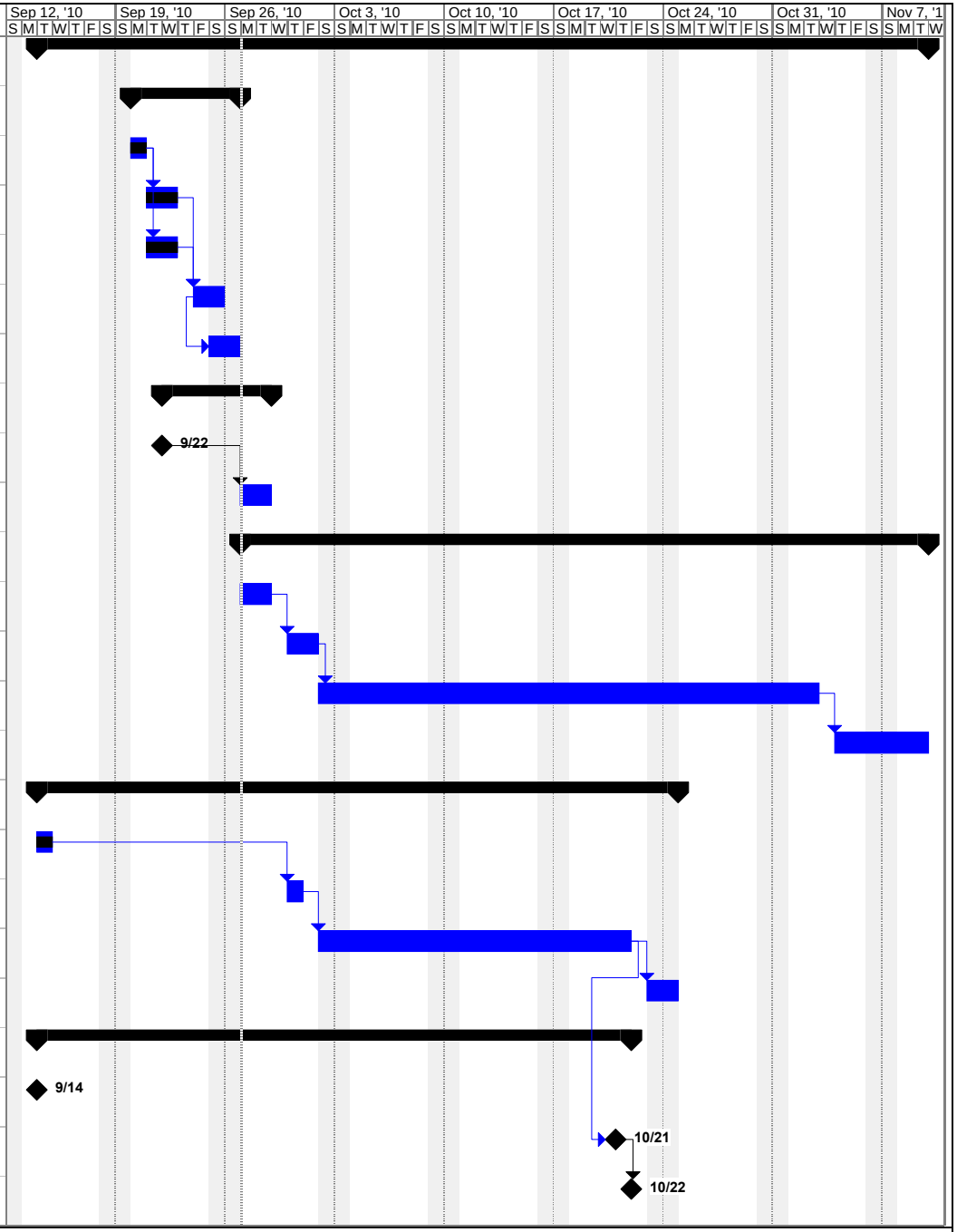
The Site Safety & Health Officer (SSHO) will establish appropriate levels of PPE for each work activity based on review of historical site information, existing data, and an evaluation of the potential for exposure during each task. The following table provides a summary of the PPE requirements for CHES personnel.

Table 3: Required PPE for IAI Personnel by Work Task

Task(s)	Body	Head	Hand	Foot	Respiratory
▪ Operate off road forklift/Boom Truck (outside of dewatering pad) ▪ Unload equipment & materials (outside of dewatering pad) ▪ Use hand & power tools (outside of dewatering pad)	▪ high vis safety vest ▪ long pants ▪ minimum 4" shirt sleeve	▪ Hard hat ▪ Safety glasses ▪ Hearing protection as needed	▪ Work gloves as needed	▪ Steel toe boots with non-skid soles	▪ None
▪ Water filtration System	▪ high vis safety vest ▪ long pants ▪ minimum 4" shirt sleeve	▪ Hard hat ▪ Safety glasses ▪ Face shield ▪ Hearing protection	▪ Work gloves	▪ Steel toe boots with non-skid soles	▪ None
▪ Media Change-out	▪ long pants ▪ minimum 4" shirt sleeve ▪ high vis safety vest	▪ Hard hat ▪ Safety glasses ▪ Face shield ▪ Hearing protection as needed	* Work gloves, nitrile gloves for contaminated media	▪ Waterproof steel toe boots with non-skid soles	▪ None
Upgrade PPE when: 6. An individual performing tasks requests it, 7. There is a change in work tasks that will increase contact or potential contact with hazardous materials, 8. Gas or vapor emission occurs or is likely to occur, 9. There is a known or suspected presence of dermal hazards, or 10. Action levels are exceeded		**Downgrade PPE when:**	4. New information indicating that situation is less hazardous than originally thought is revealed,	5. There is a change in site conditions that decrease the hazard, or	6. There is a change in work task that will reduce contact with hazardous materials

APPENDIX F

ID	Task Name	Start	Finish
1	**Ceresco Dam**	**9/14/10**	**11/9/10**
2	**Pad Construction**	**9/20/10**	**9/26/10**
3	Strip and Stage Topsoil	9/20/10	9/21/10
4	Prep Subgrade	9/21/10	9/22/10
5	Install Access Road	9/21/10	9/22/10
6	Install Liner	9/23/10	9/25/10
7	Install Drainage Aggregate	9/24/10	9/26/10
8	**Geotubes**	**9/22/10**	**9/29/10**
9	Geotubes Delivered to Site	9/22/10	9/22/10
10	Tubes Installed	9/27/10	9/29/10
11	**Water Treatment Plant**	**9/27/10**	**11/9/10**
12	Mobilize and Equipment Delivery	9/27/10	9/29/10
13	Start-up and Shake Down	9/30/10	10/1/10
14	Water treatment	10/2/10	11/2/10
15	Demob	11/3/10	11/9/10
16	**Dredger**	**9/14/10**	**10/25/10**
17	Mobilize Dredge Equipment	9/14/10	9/14/10
18	Start-up and Shakedown	9/30/10	10/1/10
19	Dredging	10/2/10	10/22/10
20	Demob	10/23/10	10/25/10
21	**Enbridge / EPA Inspection**	**9/14/10**	**10/22/10**
22	**Enbridge Inspection**	9/14/10	9/14/10
23	**EPA Inspection**	10/21/10	10/21/10
24	EPA Division Supervisor Sign-off	10/22/10	10/22/10



Project: Ceresco Dam Schedule Rev5
Date: 9/27/10

Summary Milestone Task

APPENDIX G – MSDS for Flocculant and Coagulant

Organic Cationic Coagulant
Solve 426

Material Safety Data Sheet

Date Issued: 08/18/08
Date Revised: 08/18/08

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **SOLVE 426**
CHEMICAL TYPE: Cationic polyamine
Molecular Formula: Mixture
COMPANY: WaterSolve, LLC, 4964 Starr St. SE, Grand Rapids, MI 49546, USA
For Product information call 616-575-8693.

EMERGENCY PHONE: For emergency involving spill, leak, fire, exposure or accident call CHEMTREC: 1-800-424-9300. Outside the USA and Canada call 708-527-3887.

2. COMPOSITION/INFORMATION ON INGREDIENTS

OSHA Regulated Components
No Permissible Exposure Limits (PEL/TLV) have been established by OSHA or ACGIH.

3. HAZARDS IDENTIFICATION

Emergency Overview
Appearance and odor: Colorless to amber liquid, slight amine type odor.
Statement of Hazard: **Caution! May cause eye and skin irritation**
Important! Spills of this product are very slippery when wet.

Potential Health effects
Effects of exposure:
The acute oral (rat), acute dermal (rabbit) LD50, and 4-hour inhalation (rat) LC50 values for this material are 6,160 mg/kg, >10,000 mg/kg respectively. The 4-hour inhalation (rat) LLLLC50 value is estimated to be > 2,500 ppm. Direct contact with this material may cause mild eye and skin irritation.

4. FIRST AID MEASURES

Ingestion:
If swallowed, call a physician immediately. Only induce vomiting at the instruction of a physician. Never give anything by mouth to an unconscious person.

Skin Contact:
Wash immediately with plenty of water and soap.

Eye Contact:
Rinse immediately with plenty of water for at least 15 minutes.

Inhalation:
Material is not expected to be harmful if inhaled. Remove to fresh air.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:
Use water spray, carbon dioxide or dry chemical.

Protective Equipment:
Firefighters, and others exposed, wear self-contained breathing apparatus.

Special Hazards:
Keep containers cool by spraying with water if exposed to fire.
Mechanical/Static Sensitivity Statements: None

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:
Where, exposure level is not known, wear approved, positive pressure, self-contained respirator. Where exposure level is known, wear approved respirator suitable for level of exposure. In addition to the protective clothing/equipment in Section 8 (Exposure Controls/Personal Protection), wear impermeable boots.

Methods For Cleaning Up:
Products may cause a slip hazard. Spilled material should be absorbed onto an inert material and scooped up. Flush spill area thoroughly with water and scrub to remove residue. If slipperiness remains apply more dry-sweeping compound.

7. HANDLING AND STORAGE

HANDLING
Precautionary Measures: Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.
Special Handling Statements: None

STORAGE
To avoid product degradation and equipment corrosion, do not use iron, copper or aluminum containers or equipment.

Store Temperature: Room temperature
Reason: Integrity

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Measures:
Engineering controls are not usually necessary if good hygiene practices are followed.

Respiratory Protection:
For operations where inhalation exposure can occur, use an approved respirator recommended by an industrial hygienist after an evaluation of the operation. Where inhalation exposure can not occur, no respiratory protection is required.

Eye Protection:
Wear eye/face protection such as chemical splash proof goggles or face shield.

Skin Protection:
Avoid skin contact. Wear impermeable gloves.

Additional Advice:
Before eating, drinking, or smoking, wash face and hands thoroughly with soap and water.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor:	Colorless to amber liquid, amine type odor
Boiling Point:	212°F; 100°C
Melting Point:	-18°C, 0°F
Vapor Pressure:	Not applicable
Specific Gravity/Density:	1.1– 1.2
Vapor Density:	Not available
% Volatile (By Wt):	50 (water)
pH:	4-7
Saturation in Air (% by Vol):	Not applicable
Evaporation Rate:	Not applicable
Solubility in Water:	Complete
Volatile Organic Content:	Not available
Flammable Properties	
Flash point:	>93°C 200° F (method: Closed Cup)
Flammable Limits (% by vol):	Not applicable
Autoignition temp:	Not available
Decomposition temp:	Not available
Partition Coefficient:	Not applicable
Odor threshold:	Not available

10. STABILITY AND REACTIVITY

Stability:	Stable
Conditions to avoid:	None known
Polymerization:	Will not occur
Conditions to Avoid:	None known
Incompatible Materials:	Avoid aluminum, iron and copper. Strong oxidizers, acids.
Hazardous Decomposition Products:	Dimethylamine Carbon monoxide Carbon dioxide Ammonia Oxides of nitrogen Hydrogen chloride

11. TOXICOLOGICAL INFORMATION

Toxicological information for the product is found under Section 3.
Toxicological information on the OSHA regulated components of this product is as follows:

This product contains no OSHA regulated (hazardous) components.
This product contains no WHMIS regulated (hazardous) components.
California Proposition 65 Warning (applicable in California only) - This product contains (a) chemical(s) known to the State of California to cause cancer and birth defects or other reproductive harm.

12. ECOLOGICAL INFORMATION LC50

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. All ecological information provided was conducted on a structurally similar product.
This material is not classified as dangerous for the environment. Acute toxicity tests conducted on the polymer using environmentally representative water gave the following results:

Algae Test Results
Test: Growth Inhibition (OECD 201)
Duration: 72 h
Species: Green Algae (*Selenastrum capricornutum*)
IC50: >100 mg/L

Fish Test Results
Test: Acute toxicity, freshwater (OECD 203)
Duration: 96 h
Species: Zebra fish (*Brachydanio rerio*)
LC50: >100 mg/L

Invertebrate Test Results
Test: Acute Immobilization (OECD 202)
Duration: 48 h
Species: Water flea (*Daphnia magna*)
EC50: >100 mg/L

Degradation:
Test: CO2 Evolution: Modified Sturm (OECD 301B)
Duration: 28 day
<70%
Information based on a structurally similar material. This material is not readily biodegradable (OECD 301B). The large polymer size is incompatible with transport across biological membranes and diffusion. The bioconcentration factor is therefore considered to be zero.

13. DISPOSAL CONSIDERATIONS

The information on RCRA waste classification and disposal methodology provided below applies only to the product, as applied. If the material has been altered or contaminated, or it has exceeded its recommended shelf life, the guidance may be inapplicable. Hazardous waste classification under federal regulations (40 CFR Part 261 et seq) is dependent upon whether a material is a RCRA "listed hazardous waste" or has any of the four RCRA "hazardous waste characteristics." Refer to 40 CFR Part 261.33 to determine if a given material to be disposed of is a RCRA "listed hazardous waste"; information contained in Section 15 of this MSDS is not intended to indicated if the product is a "listed hazardous waste." RCRA Hazardous Waste Characteristic. There are four characteristics defined in 40 CFR Section 261.21-61.24: Ignitability, Corrosivity, Reactivity, and Toxicity. To determine Ignitability, See Section 5 of this MSDS (flash point). For Corrosivity, see sections 9 and 14 (pH and DOT corrosivity). For Reactivity, see Section 10 (incompatible materials). For Toxicity, see Section 2 (composition). Federal regulations, may also apply to the classification of the material to be disposed. WaterSolve encourages the recycle, recovery and reuse of materials classified as RCRA hazardous wastes to be disposed of by thermal treatment or incineration at EPA approved facilities. WaterSolve has provided the foregoing for information only; the person generating the waste is responsible for determining the waste classification and disposal method.

14. TRANSPORT INFORMATION

This section provides basic shipping classification information. Refer to appropriate transportation regulations for specific requirements.

USDOT

Proper Shipping Name: Not applicable/Not regulated
Hazardous Substances: Not applicable

TRANSPORT CANADA

Proper Shipping Name: Not applicable/Not regulated

ICAO/IATA

Proper Shipping name: Not applicable/Not regulated
Packing instructions/maximum net quantity per package:
Passenger Aircraft:
Cargo Aircraft:

IMO

Proper shipping name: Not applicable/Not regulated

15. REGULATORY INFORMATION

INVENTORY INFORMATION

USA : All components of this product are included on the TSCA Chemical Inventory or are not required to be listed on the TSCA Chemical I inventory.

Canada: All components of this product are included on the Domestic Substances List (DSL) or are not required to be listed on the DSL
.

European Union (EU): All components of this product are included on the European Inventory of Existing Chemical Substances (EINECS) or are not required to be listed on EINECS.

Australia: All components of this product are included in the Australian Inventory of Chemical Substances(AICA).

China: All components of this product are included on the Chinese inventory or are not required to be listed on the Chinese Inventory.

Japan: All components of this product are included on the Japanese (ENCS) inventory or are not required to be listed ion the Japanese Inventory.

Korea: All components of this product are included on the Korean (ECL) inventory or are not required to be listed on the Korean inventory

Philippines: All components of this product are included on the Philippine (PICCS) inventory or are not required to be listed on the Philippine inventory.

OTHER ENVIRONMENTAL INFORMATION

The following components of this product may be subject to reporting requirements pursuant to Section 313 of CERCLA (40 CFR 372), Section 12(b) of TSCA, or may be subject to release reporting requirements (40 CFR 307, 40 CFR 311, etc.) See Section 13 for information on waste classification and waste disposal of this product. This product does not contain any components regulated under sections of the EPA.

Product Classification under section 311 of SARA
Not applicable

16. OTHER INFORMATION

NFPA HAZARD RATING (National Fire Protection Association)

Health 1- Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

Fire 1 – Materials that must be preheated before ignition can occur.

Reactivity 0 –Materials that in themselves are normally stable, even under fire exposure conditions.

REASON FOR ISSUE: New Format

Organic Cationic Emulsion
Solve 137

Material Safety Data Sheet

Date Issued: 03/02/2009
Date Revised: 03/02/2009

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **SOLVE 137**
CHEMICAL TYPE: Liquid Cationic Polyacrylamide

COMPANY: WaterSolve, LLC, 4964 Starr St. S.E. Grand Rapids, MI 49546, USA
For Product information call 616-575-8693.

EMERGENCY PHONE: For emergency involving spill, leak, fire, exposure or accident call CHEMTREC: 1-800-424-9300. Outside the USA and Canada call 703-527-3887.

2. COMPOSITION/INFORMATION ON INGREDIENTS

OSHA Regulated Components

Component	CAS NO.	%	OSHA (pel)	AGGIH (TLV)
Petroleum distillate Hydrotreated light	064742-47-8	20-25	500 ppm 1200mg/m3 165ppm (Supplier)	(hud)

No permissible exposure limits (PEL/TLV) have been established by OSHA or ACGIH.

3. HAZARDS IDENTIFICATION

Emergency Overview

Appearance and odor: Off white, viscous liquid, slight hydrocarbon odor
Statement of Hazard: WARNING! CAUSES EYE AND SKIN IRRITATION

Potential Health effects

Effects of exposure:
The estimated acute oral (rat) LD50, acute dermal (rabbit) LD50 and 4-hour inhalation (rat) LC50 values for this material are >5000mg/kg , >2000 mg/kg and >20 mg/L respectively. Direct contact with this material may cause moderate skin and eye irritation . Refer to Section 11 for toxicology information on the regulated components of this product.

4. FIRST AID MEASURES

Ingestion:
If swallowed, call a physician immediately. Only induce vomiting at the instruction of a physician. Never give anything by mouth to an unconscious person.

Skin contact:
Remove contaminated clothing and shoes without delay. Wash immediately with plenty of water. Do not reuse contaminated clothing without laundering. Get medical attention if pain or irritation persists after washing or if signs and symptoms of overexposure appear.

Eye contact:
Rinse immediately with plenty of water for at least 15 minutes. Obtain medical advice if there are persistent symptoms.

Inhalation:
Material is not expected to be harmful if inhaled. Remove to fresh air.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:
Use water spray, carbon dioxide or dry chemical.

Protective Equipment:
Firefighters, and others exposed, wear self-contained breathing apparatus. Wear full firefighting protective clothing. See MSDS Section 8 (exposure Controls/Personal Protection)

Special Hazards:
Keep containers cool by spraying with water if exposed to fire.

6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Personal precautions:
Refer to Section 8 (Exposure Controls/Personal Protection) for appropriate personal protective equipment.

Methods for Cleaning Up:
Products may cause a slip hazard. Spilled material should be absorbed onto an inert material and scooped up. Prevent liquid entering sewers. Flush spill area with water and scrub to remove residue. . If slipperiness remains apply more dry-sweeping compound.

HANDLING AND STORAGE

Handling
Precautionary Measures: Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

Special Handling Statements: None

STORAGE
To avoid product degradation and equipment corrosion, do not use iron, copper or aluminum containers or equipment. Flashpoint determinations on materials of this type are required by certain regulations and scientific standards to be performed using a Pensky-Martens type close cup test method. This method indicates a flash point greater than 93.3°C (200°F). Although there was no flashpoint detected below 93.3°C (200°F) by the Pensky-Martens Closed Tester method, some flammable vapors were evolved during the test as evidenced by the enlargement of the test flame: therefore, caution should be exercised during storage and handling.

Storage Temperature: Room temperature
Reason : Integrity

7. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures:
Where this material is not used in a closed system, good enclosure and local exhaust ventilation should be provided to control exposure.

Respiratory protection:
Where exposures are below the established exposure limit, no respiratory protection is required. Where exposures exceed the established exposure limit, use respiratory protection recommended for the material and level of exposure.

Eye protection:
Wear eye/face protection such as chemical splash proof goggles or face shield. Eyewash equipment and safety shower should be provided in areas of potential exposure.

Skin protection:
Avoid skin contact. Wear impermeable gloves and suitable protective clothing.

Additional Advice:
Food, beverages, and tobacco products should not be carried, stored, or consumed where this material is in use. Before eating, drinking, or smoking, wash face and hands thoroughly with soap and water.

8. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor:	Off white liquid; slight hydrocarbon odor
Boiling Point:	Aqueous phase 100 ^{o}C; Oil phase ~175 ^{o}C
Melting Point:	Not available
Vapor Pressure:	Similar to water
Specific Gravity:	~1.0
Vapor Density:	similar to water
% Volatile (By Wt):	~50
pH:	3-4 in water
Saturation in Air (% by Vol):	Not available
Evaporation Rate:	Not available
Solubility in Water:	Limited by viscosity
Volatile Organic Content:	Not available
Flash point:	>100°C 212°F closed cup
Flammable Limits (% by vol):	Not available
Autoignition temp:	Not available
Decomposition temp:	Not available
Odor Threshold	Not available
Partition coefficient (n-octanol/water)	Not available

9. STABILITY AND REACTIVITY

Stability:	Stable
Conditions to avoid:	Avoid contact with strong oxidizing agents.
Polymerization:	Will not occur
Conditions to Avoid:	None known
Materials to avoid:	Strong oxidizing agents
Hazardous decomposition Products:	carbon monoxide Carbon dioxide Ammonia Oxides of nitrogen Hydrochloric acid

10. TOXICOLOGICAL INFORMATION

Toxicological information for the product is found under Section 3.
Toxicological information on the OSHA regulated components of this product is as follows:

Petroleum distillates, hydrotreated light(CAS#64742-47-8) has acute oral (rat) and dermal (rabbit) LD50 values of >5 g/kg and >3.16 g/kg, respectively. Prolonged or repeated skin contact tends to remove skin oils, possibly leading to irritation and dermatitis. Direct contact may cause eye irritation. Overexposure to high vapor concentrations, >~700PPM, are irritating to the eyes and respiratory tract and may cause headaches, dizziness, drowsiness, and other central nervous system effects, including death. Aspiration of minute amounts during ingestion or vomiting may cause mild to severe pulmonary injury and possible death. In a 90-day oral gavage (rats) study at 100, 500 and 1000 mg/kg, no treatment related mortalities were observed. There were no significant changes in body weights or food consumption in any dose groups. Increased liver weights were observed in male and female rats a 500 and 1000 mg/kg. Increased kidney weights were observed only in male rats at 500 and 1000mg/kg. Testes weights were significantly elevated in male rats at 1000 mg/kg. Kidney effects indicative of light hydrocarbon nephropathy, occurred in male rat kidneys at all dose levels. Histological findings of hepatocellular hypertrophy were seen in the livers of male rats at 1000mg/kg and in female rats at 500 and 1000 mg/kg. All treatment-related effects were reversible within the 4- week recovery period. Observed kidney effects (including light hydrocarbon nephropathy and increased kidney weight) are a unique response by male rats to chronic hydrocarbon exposure, which the U.S . EPA has declared no relevant to humans. High-dose liver effects (including hepatocellular, or enlarged liver cells) are a direct consequence of the sustained high-fat hydrocarbon diet. The No observed Adverse Effect Level (NOAEL) for this study was 1000mg/kg.

Alcohols (c10-16), ethoxylated toxicological properties have not been fully investigated. Based on similar materials, the acute oral (rat) LD50 is estimated to range from 1600-2500 mg/kg and the acute dermal (rabbit) LD50 value is estimated to be >2000mg/kg. Similar materials produced severe eye irritation and moderate skin irritation in studies with rabbits.

Alcohols C12-14 alcohol ethoxylated toxicological properties have not been fully investigated. The oral LD50 (rat) of this mixture is excepted to be consistent with the chemical family of ethoxylated alcohol surfactants and range from 1.6 to 2.5 g/kg. The acute dermal (rabbit) LD50 value is estimated to be >2.0 g/kg. One excepted component of this mixture was severely irritating to rabbits eyes (undiluted, Draize score=60). This mixture is expected to be moderately irritating to skin, based on data reported for C9-C11 6EO: (primary irritation index) Pll=5.3/8.

Alcohols (c12-16), ethoxylated toxicological properties have not been fully investigated. Based on similar materials, the acute oral (rat) LD50 is estimated to range from 1600-2500 mg/kg and the acute dermal (rabbit) LD50 value is estimated to be >2000 mg/kg. Similar materials produced severe eye irritation and moderate skin irritation in studies with rabbits.

California Proposition 65 Warning (applicable in California only) - This product contains (a) chemical(s) known to the State of California to cause cancer and birth defects or other reproductive harm.

11. ECOLOGICAL INFORMATION LC 50

All ecological information provided was conducted on a structurally similar product. This material is not classified as dangerous for the environment. The effects on aquatic organisms are due to an external (non-systemic) mode of action, and are significantly reduce (by a factor of 7-20) within 30 minutes due to binding of the product to dissolved organic and inorganic sorbents such as clays and silts. Acute toxicity tests conducted on the polymer using environmentally representative water gave the following results:

ALGAE TEST RESULTS
Test: Growth Inhibition (OECD 201) Due to the cationicity of the polymer, an algae growth inhibition test is not appropriate.

FISH TEST RESULTS
Test: Acute toxicity, freshwater (OECD 203)
Duration: 96 hr
Species: Zebra Fish (Brachydanio rerio) LC 50 >1-10 mg/l

INVERTEBRATE TEST RESULTS
Test: Acute Immobilization (OECD 202)
Duration: 48hr
Species: Water Flea (Daphnia magna) EC 50 >10-100 mg/l

DEGRADATION
Test: CO2 Evolution: Modified Sturm (OECD 301B)
The polymeric ingredient is not readily biodegradable, but degradable by hydrolysis. The large polymer size is incompatible with transport across biological membranes and diffusion; the bioconcentration factor is therefore considered to be zero.

13. DISPOSAL CONSIDERATIONS

The information on RCRA waste classification and disposal methodology provided below applies only to the product, as applied. If the material has been altered or contaminated, or it has exceeded its recommended shelf life, the guidance may be inapplicable. Hazardous waste classification under federal regulations (40 CFR Part 261 et seq) is dependent upon whether a material is a RCRA "listed hazardous waste" or has any of the four RCRA "hazardous waste characteristics." Refer to 40 CFR Part 261.33 to determine if a given material to be disposed of is a RCRA "listed hazardous waste"; information contained in Section 15 of this MSDS is not intended to indicated if the product is a "listed hazardous waste." RCRA Hazardous Waste Characteristic. There are four characteristics defined in 40 CFR Section 261.21-61.24: Ignitability, Corrosivity, Reactivity, and Toxicity. To determine Ignitability, See Section 5 of this MSDS (flash point). For Corrosivity, see sections 9 and 14 (pH and DOT corrosivity). For Reactivity, see Section 10 (incompatible materials). For Toxicity, see Section 2 (composition). Federal regulations, may also apply to the classification of the material to be disposed. The company encourages the recycle, recovery and reuse of materials classified as RCRA hazardous wastes to be disposed of by thermal treatment or incineration at EPA approved facilities. The company has provided the foregoing for information only; the person generating the waste is responsible for determining the waste classification and disposal method.

14. TRANSPORT INFORMATION

This section provides basic shipping classification information. Refer to appropriate transportation regulations for specific requirements.

USDOT
Proper Shipping Name: Not applicable/Not regulated
Transport Label Required: None
Hazardous Substances: Not applicable

TRANSPORT CANADA
Proper Shipping Name: Not applicable/Not regulated

ICAO/IATA
Proper Shipping name: Not applicable/Not regulated
Packing instructions/maximum net quantity per package:
Passenger Aircraft:
Cargo Aircraft:

IMO
Proper shipping name: Not applicable/Not regulated

15. REGULATORY INFORMATION

USA: All components of this product are included on the TSCA Chemical Inventory or are not required to be listed on the TSCA Chemical I inventory.

Canada: All components of this product are included on the Domestic Substances List (DSL) or are not required to be listed on the DSL
.
European Union (EU): All components of this product are included on the European Inventory of Existing Chemical Substances (EINECS) or are not required to be listed on EINECS.

Australia: All components of this product are included in the Australian Inventory of Chemical Substances(AICA) or are not required to be listed on AICS.

China: All components of this product are included on the Chinese inventory or are not required to be listed on the Chinese Inventory.

Japan: All components of this product are included on the Japanese (ENCS) inventory or are not required to be listed ion the Japanese Inventory.

Korea: All components of this product are included on the Korean (ECL) inventory or are not required to be listed on the Korean inventory

Philippines: All components of this product are included on the Philippine (PICCS) inventory or are not required to be listed on the Philippine inventory.

OTHER ENVIRONMENTAL INFORMATION

The following components of this product may be subject to reporting requirements pursuant to Section 313 of CERCLA (40 CFR 372), Section 12(b) of TSCA, or may be subject to release reporting requirements (40 CFR 307, 40 CFR 311, etc.) See Section 13 for information on waste classification and waste disposal of this product.
This product does not contain any components regulated under sections of the EPA.

Product Classification under section 311 of SARA
Acute (Y)

16. OTHER INFORMATION

NFPA HAZARD RATING (National Fire Protection Association)

Health 2- Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

Fire 1 – Materials that must be preheated before ignition can occur.

Reactivity 0 –Materials that in themselves are normally stable, even under fire exposure conditions.

REASON FOR ISSUE: New Format