DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS Code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: Crest Hill Facility, Flexible Products Company
Facility Address : 2050 North Broadway Street, Crest Hill, Illinois
Facility EPA ID#: ILD 043912922/LPC 1970455016

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   _X__ If yes – check here and continue with #2 below.

   _____ If no – re-evaluate existing data, or

   _____ If data are not available skip to #8 and enter "IN" (more information needed) status

Definition of Environmental Indicators (for the RCRA Corrective Action)

EIs are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination: subject to RCRA corrective action at or from the identified facility (i.e., facility-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA. The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., nonaqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determination status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be "**contaminated**"[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

_X_ If yes – continue after identifying key contaminants citing appropriate "levels" and referencing supporting documentation.

____ If no – skip to #8, and enter "YE," status code after providing or citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

____ If unknown – skip to #8 and enter "IN" status code.

Rationale and Reference(s)

Facility History and Environmental Investigations

The property was operated as a stone quarry from approximately mid 1800s to about 1920 at which point a lumber company operated on site from 1924 through 1964. In 1970, the quarry operated as a solid waste disposal facility under a permit receiving a variety of waste materials. In late 1972, urethane based foam products were manufactured by the Flexible Products Company until September, 2004.

The nature and extent of soil contamination present beneath the facility is largely confined to within the limits of the former quarry/landfill that makes up the central portion of the approximately 9-acre site. The extent of impacted groundwater also is also largely confined to the quarry area (Table 1).

Shallow groundwater is present within the fill materials (principally sands and gravel with layers of silt) and shallow limestone bedrock at the facility and is considered a single aquifer. In general, groundwater flow direction is to the east (Figure 4). The distribution of groundwater concentrations exceeding the U.S. Environmental Protection Agency (USEPA) maximum contamination level (MCL) are listed in Table 1. Constituents detected in groundwater above the MCL values at the site include metals, semi-volatile organic and volatile organic contaminants.

Samples of soil, groundwater, surface water, sediment, soil gas, air, and NAPL were collected for environmental analysis during these investigations. The environmental investigation results document that soil and groundwater contamination at the facility are primarily associated with hydrocarbon-based fill materials placed in portions of the former quarry in the early 1970s.

TABLE 1
Contamination found in groundwater that exceeds USEPA MCL Screening Levels

	MCL	Groundwater Maximum Detected Concentration	Location of Maximum Result	Interior/Bedrock
Total METALS (ppm)				
Arsenicn	0.01	0.0895 J	ERM-3	Interior
Lead	0.015	6.5 J	ERM-3	Interior
Manganese	NA	6.3	MW-8r	Interior
Mercury	0.002	0.0018	ERM-3	Interior
Thallium	0.002	0.0058 J	ERM-3	Interior
PCBs (ppb)				
Aroclor-1242	NA	0.08 J	MW-15	Interior
Aroclor-1254	NA	0.07 J	MW-15	Interior
SVOCs (ppb)				
Benzo (a) anthracene	NA	0.263	MW-8r	Interior
Benzo (b) fluoranthene	NA	0.382	MW-8r	Interior

Dibenzo (a,h) anthracene	NA	0.381	ERM-5	Perimeter (Bedrock)
Indeno (1,2,3-c,d) pyrene	NA	0.296	MW-8r	Interior
Naphthalene	NA	24	MW-15	Interior
VOCs (ppb)				
1,1-Dichloroethane	NA	2.98 J	MW-13A	Interior
1,2,4-Trimethylbenzene	NA	17	MW-15	Interior
Benzene	5	2.81 J	MW-13B	Interior
Chloroform	NA	1.18 J	MW-18	Perimeter (Bedrock)
Ethylbenzene	NA	2.7	MW-15	Interior

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination?

   _X_ If yes – continue after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

   ____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) – skip to #8 and enter "NO" status code, after providing an explanation.

   ____ If unknown – skip to #8 and enter "IN" status code

Rationale and Reference(s):

Based on available information about the facility geologic, hydrogeologic, and hydrologic conditions, groundwater contamination at the facility is considered stabilized. This determination was made based on multiple lines of evidence, including the following:

- Knowledge of facility history and approximate timeframe of releases
- Removal or control of source(s)
- Understanding of unconsolidated and bedrock geologic conditions and groundwater flow patterns
- Groundwater monitoring data supporting plume stabilization

Information supporting each of these lines of evidence is detailed in the following paragraphs.

- The primary sources of contamination are controlled.

  ⇒ Disposal in the former quarry was discontinued in the 1970s, and the quarry was filled to its current grade in the early 1980s. The facilities and operations causing the observed contamination have been demolished and/or discontinued. All manufacturing operations were discontinued in 2004, and the manufacturing buildings were demolished from 2004 to 2005.

  ⇒ NAPL found in the former quarry/landfill was only found within a localized area within the former quarry. NAPL appears to be related to petroleum sludge that was reportedly placed in the quarry in 1970. Migration of the free-phase product does not appear to have occurred during the last 20 years based on monitoring well measurements in 1989, 1990, 2002, and 2008. There is no NAPL or NAPL-related constituents in groundwater proximate to the downgradient facility perimeter based on groundwater chemical data. Migration of NAPL is not expected in the future based on: (a) no evidence of migration beyond the quarry in

over 38 years since the material was placed in the quarry; (b) viscous nature of the NAPL; and (c) the measured low permeability of bedrock that surrounds the fill.

- Groundwater flow patterns and the distribution of constituents of interest (COI; EI Figures 1 to 4) above USEPA risk-based criteria (to be conservative, the lower, more stringent, of the consolidated USEPA tap water and MCL screening levels was chosen as the USEPA risk-based criteria) in groundwater have been characterized and are well understood through a series of 28 existing or historic monitoring wells spatially distributed across the facility. Groundwater flow patterns observed during previous rounds of investigation are essentially the same. Distribution of contaminants are included in the CCR (Sections 3 and 4, and Appendix A) and the 2009 Bedrock and Groundwater Investigation Report (Section3, Figures 3a and 3b).
- Groundwater monitoring data support stabilization of groundwater contamination.
  - ⇒ Groundwater samples have been collected to monitor groundwater quality periodically beginning with the initial facility investigation activities in 1988 and have continued on and irregular basis through 2009.
  - ⇒ Interior wells (represented by ERM-1, ERM-2/MW-13A, and ERM-3/MW-12) show downward concentration trends or sporadic detections of some contaminants above screening levels. Samples were collected only twice (2002 & 2003) from the other interior well TSC-2 and were higher for arsenic in the second sample. These results are considered to be within the expected sampling variability.
  - ⇒ Downgradient (perimeter) wells located around the property boundary (MW-2, MW-5, MW-9/9R, and MW-10/10R) show downward or sporadic contaminant concentration trends and (with one exception) have had concentrations below screening levels during the 2008 sampling event. There was a single exceedance of tap water standards for indeno(1,2,3-cd)pyrene in 2008, but this result is not considered verified since there were no previous detections, the 2008 result was nondetect in the duplicate sample, and the result was not reproduced in 2009 sampling activities. The 2009 groundwater sampling results at recently-installed perimeter downgradient bedrock wells show isolated detections slightly above screening levels for chloroform, lead, and arsenic. Most of the 2009 groundwater exceedences were estimated (J-flagged), and arsenic and lead values are similar to upgradient and/or area-wide concentrations.
  - ⇒ The city of Crest Hill municipal pumping well #1 is located about 2,300 ft west of the facility. A pressure transducer study was conducted at the site to determine whether there is hydraulic communication between this well and the shallow contaminated groundwater at the facility. It was determined to be unlikely contamination would be pulled toward the municipal well beyond the facility perimeter.

Reference

CH2M HILL. 2008. (DRAFT) Crest Hill Current Conditions Report. 2008.

CH2M HILL. 2009b. (FINAL) Bedrock and Groundwater Investigation Results, FPC Crest Hill Facility, Crest Hill, Illinois. Prepared for The Dow Chemical Company. September.

Footnotes:

[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be samples/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring location are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

_X__ If yes – continue after identifying potentially affected surface water bodies.

____ If no – skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

____ If unknown – skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The facility has limited surface water within its boundaries or adjacent to the boundaries. A small stormwater retention basin is present at the northern end of the facility (Figure 1). The storm water retention basis does not discharge from the site. The basin appears to be the discharge point for surface water runoff at the facility. No facility-related groundwater contaminant concentrations at or above the USEPA risk-based screening levels (MCL and tap water) are known to migrate offsite toward the downgradient Des Plaines River located about 0.5 miles away to the northeast.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_X_ If yes – skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonable suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) – continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

____ If unknown – enter "IN" status code in #8.

Rationale and Reference(s):

The small pond does not discharge offsite.

Footnotes:
[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

___ If yes – continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other facility-specific criteria (developed for the protection of the facility's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment[5], appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, us/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or facility-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

___ If no – (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") – skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

__ If unknown – skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Footnotes:

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts tot he surface waters, sediments or eco-systems.

7. Will groundwater **monitoring**/measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

   _X__ If yes – continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

   ____ If no – enter "NO" status code in #8.

   ____ If unknown – enter "IN" status code in #8.

Rationale and Reference(s):

Groundwater monitoring data periodically have been collected in the past, most recently in June 2009. Groundwater monitoring will be conducted in the future to verify that contaminated groundwater has remained within the dimensions of the existing area of "contaminated" groundwater at the facility and is not migrating. The proposed groundwater monitoring at Crest Hill will have the following features:

- Frequency: groundwater at the site will be sampled semi-annually for 2 years; if data indicate predictable results; the frequency may be reduced.
- Monitoring network: Downgradient perimeter bedrock wells ERM-5, MW-2, MW-4S, MW-4D, MW-5S, MW-5D, MW-9r, MW-10r, MW-17, and MW-18 will be sampled. In addition, the upgradient perimeter bedrock well (MW-1r) will also be sampled. One interior well (MW-8R) will be sampled on an annual basis to evaluate concentration trends in the central part of the fill area.
- Analytical suites: analytes shown on Table 1 of the Groundwater EI will be analyzed during groundwater sampling events, with one exception. PCBs were sampled and analyzed at 6 locations (MW-4, MW-5, MW-8R, MW-10R, MW-13A, MW-13B) in June 2008 as part of the Current Conditions Report preparation. PCBs were not detected, and therefore will not be included in future groundwater monitoring.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

_X__ YE – Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at ***Flexible Products Company Former Crest Hill Facility, ID # ILD 043912922/LPC 1970455016 located at 2050 North Broadway Street, Crest Hill, Illinois.*** Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater". This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

____ NO – Unacceptable migration of contaminated groundwater is observed or expected.

____ IN – More information is needed to make a determination.

Completed by (signature) _____ Date 1-14-2010

(print) Jennifer Dodds

(title) Environmental Scientist

Supervisor (signature) _____ Date 1-14-2010

(print) George Hamper

(title) Chief, CAS2

(EPA Region or State) Region 5

Location where References may be found:

Crest Hill Public Library
1298 Theodore Street
Crest Hill, Illinois 60403

US EPA Region 5 Records Center
77 West Jackson Blvd. 7th Floor
Chicago, Illinois 60604

Contact telephone and e-mail numbers

(name) Jennifer Dodds

(phone #) 312-886-1484

(e-mail) dodds.jennifer@epa.gov

Attachment A
Figures: Groundwater Constituents of Interest

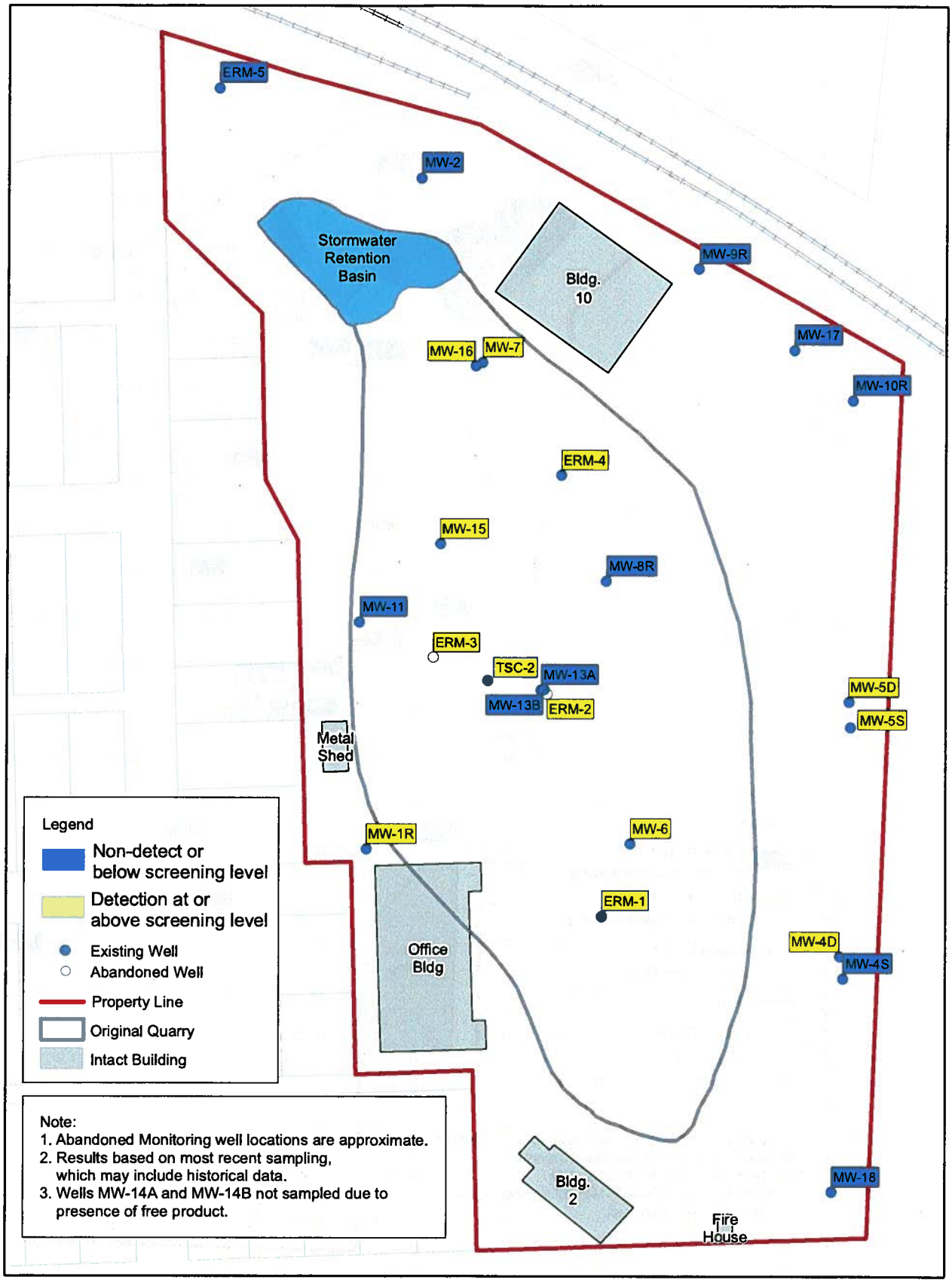


Figure 1
Extent of Arsenic in Groundwater
May, 2009
Flexible Products Company
Crest Hill, Illinois

CH2MHILL

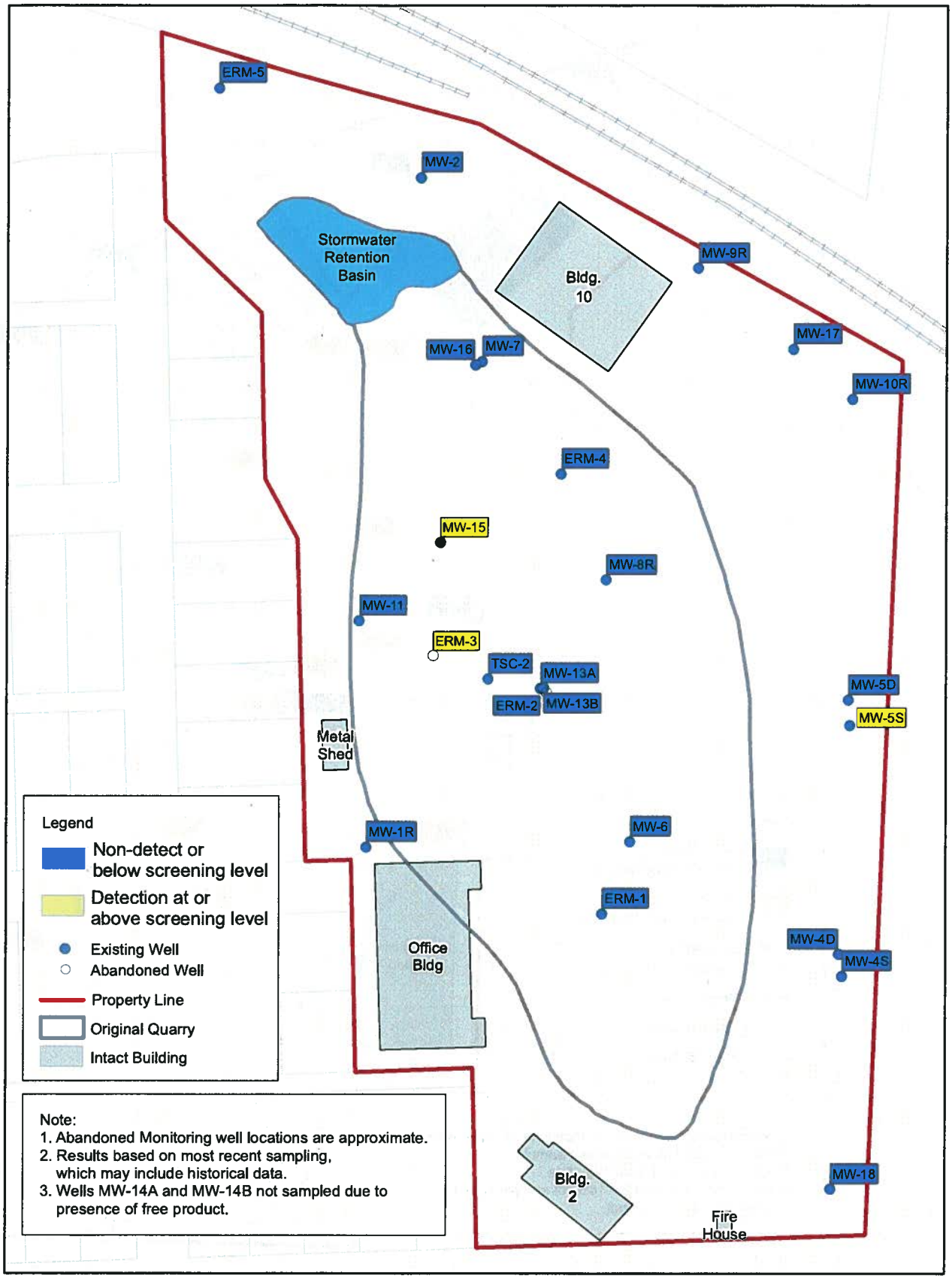


Figure 2
Extent of Lead in Groundwater
May, 2009
Flexible Products Company
Crest Hill, Illinois

CH2MHILL

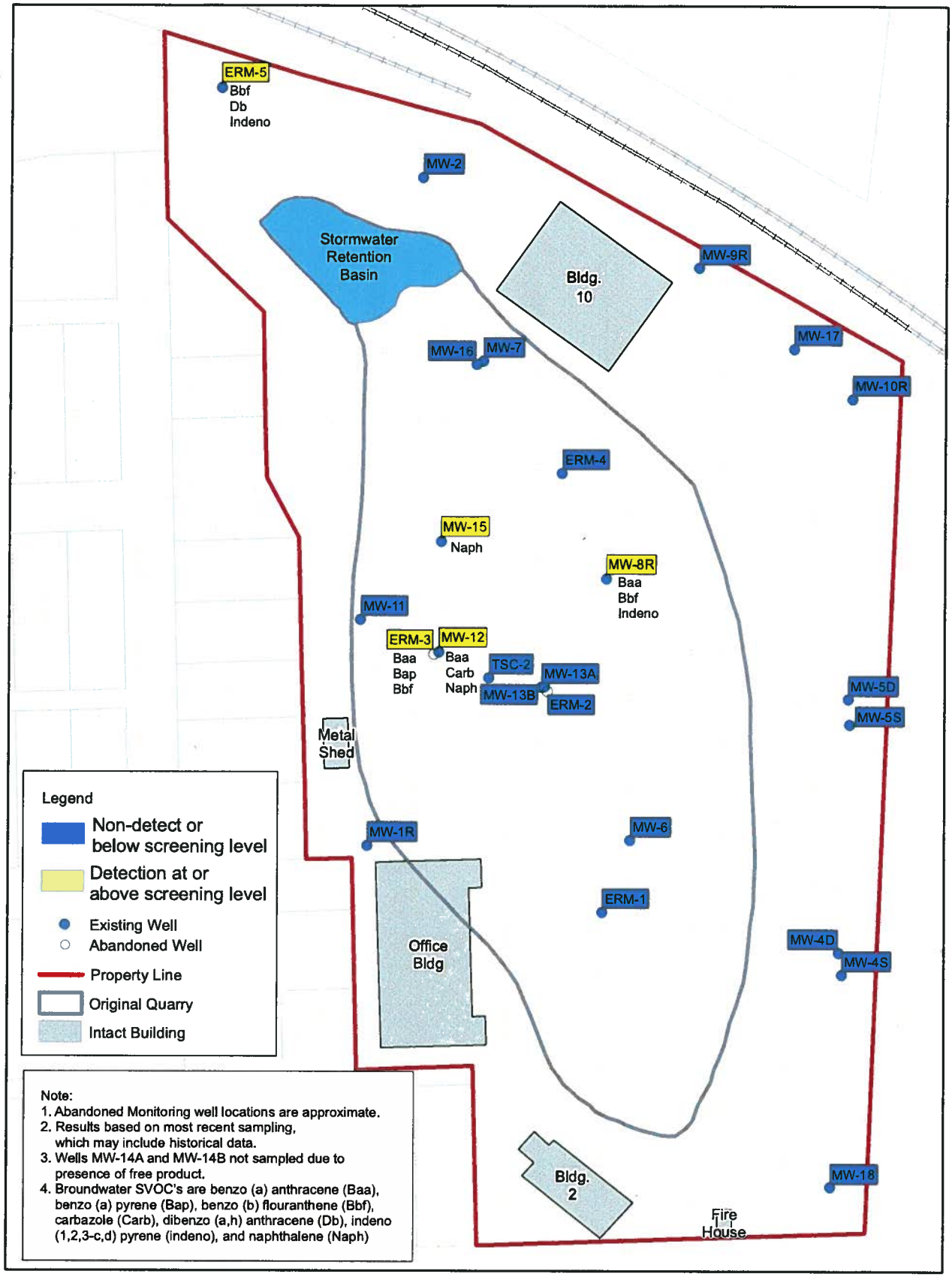
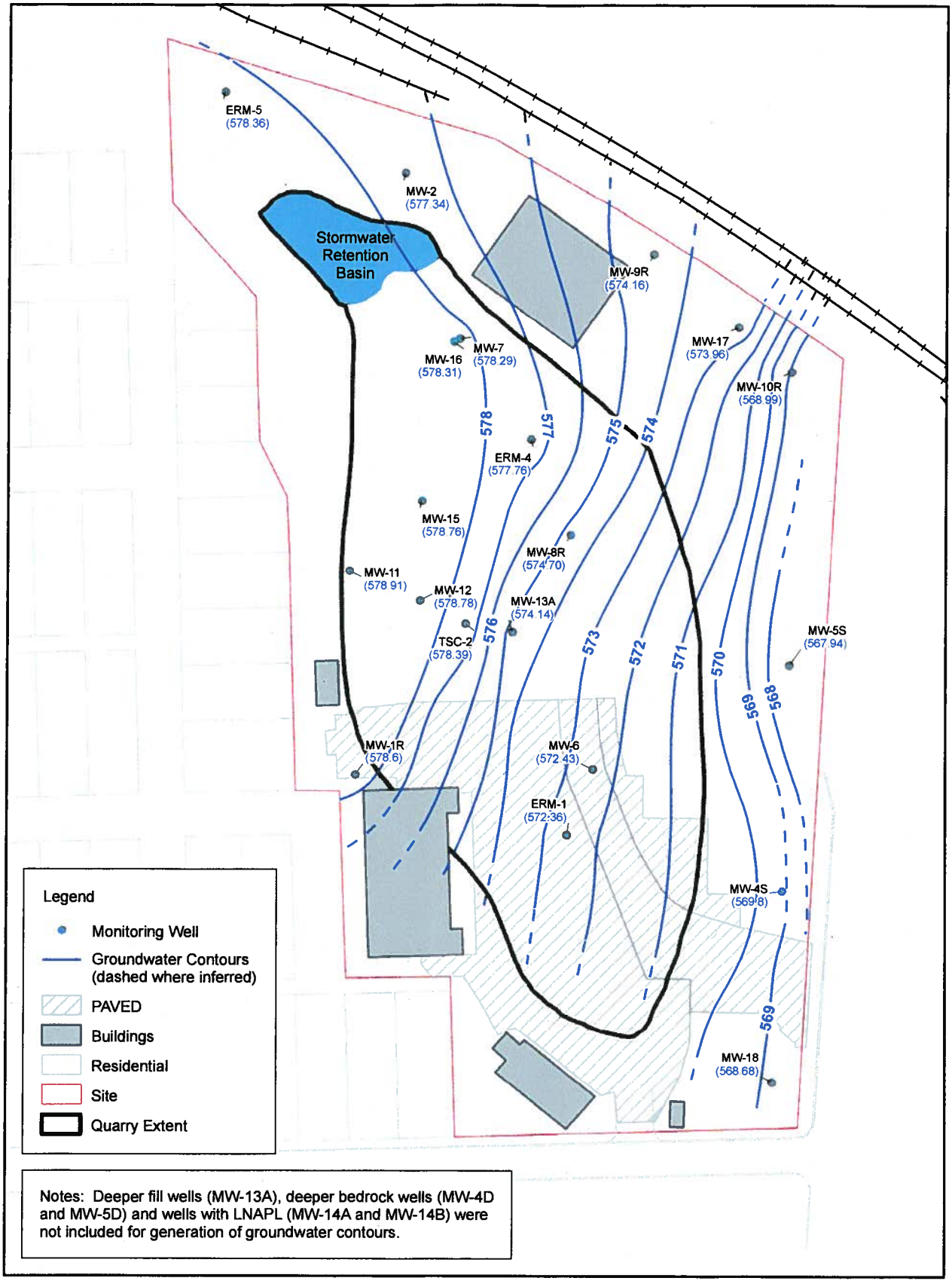


Figure 3
Extent of SVOC in Groundwater
May, 2009
Flexible Products Company
Crest Hill, Illinois

CH2MHILL



Notes: Deeper fill wells (MW-13A), deeper bedrock wells (MW-4D and MW-5D) and wells with LNAPL (MW-14A and MW-14B) were not included for generation of groundwater contours.

N

0 125 250

Feet

DRAFT

Figure 4
June 8, 2009 Potentiometric Surface
Bedrock and Groundwater Investigation
Crest Hill, Illinois

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CH2MHILL