EXPLANATION OF SIGNIFICANT DIFFERENCES

VELSICOL CHEMICAL CORPORATION SUPERFUND SITE

OPERABLE UNIT 1

SAINT LOUIS, MICHIGAN

EPA SITE ID: MID000722439

PREPARED BY:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

SEPTEMBER 2024

U.S. Environmental Protection Agency

Region 5

[This page is intentionally left blank.]

Executive Summary

This Explanation of Significant Differences (ESD) describes changes within the remedy that addresses contamination at Operable Unit (OU) 1 of the Velsicol Chemical Corporation Superfund Site and is in accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9617(c) and Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. § 300.435. This ESD documents the change in two of the fourteen remedy components of the selected remedy as described in the 2012 Record of Decision for OU1, signed by the Michigan Department of Environment, Great Lakes, and Energy (formerly known as the Michigan Department of Environmental Quality) Director on June 19, 2012, and by the EPA Region 5 Superfund Division Director on June 22, 2012.

The OU1 remedy is a combination of containment, treatment, removal, and municipal wellfield replacement. The two remedy components that necessitate this ESD are part of the containment portion of the OU1 remedy and include 1) repair of the existing upgradient slurry wall as part of a vertical barrier wall containment around the former plant site (FPS) and 2) removal of the need for a dense nonaqueous phase liquid/ groundwater collection system extension segment to address the monitoring well 19 area (MW-19 Area). Since the signing of the 2012 Record of Decision, changed conditions, as documented in associated investigations, evaluation technical memoranda, and summary reports support implementation of upgradient slurry wall repair and removal of the need for a dense nonaqueous phase liquid (DNAPL)/ groundwater collection system extension segment in the MW-19 Area.

Specifically, the upgradient portion of the slurry wall is found to have been constructed to sufficiently influence shallow groundwater flow patterns and act as a barrier to shallow unit groundwater migration. However, a 20-foot breach and a 350-foot area of substandard hydraulic performance surrounding the breach, due to groundwater leaking through the breach, were identified. It is determined that, based on seven lines of evidence from information and data collected during the 2002-2006 remedial investigations through the most recent predesign investigations in 2020 and 2023, a repair of the current upgradient slurry wall is warranted rather than installation of a steel sheet pile wall along the entire 3,100 linear foot upgradient alignment of the slurry wall.

In 2019 in situ thermal treatment was implemented in Area 1 and removed over 55,000 pounds of contaminants, of which approximately 51,000 pounds were dense nonaqueous phase liquid. Area 1 is located immediately adjacent and upgradient to the MW-19 Area. A predesign investigation in the MW-19 Area was conducted to document the changed conditions in the shallow unit, as the majority of DNAPL in this area was addressed by the Area 1 in situ thermal treatment. The investigation found an absence of widespread DNAPL with only localized residuals on the till unit. Observed DNAPL is attributed to isolated occurrences of locally trapped contaminants within or on the till surface with an observed lack of DNAPL continuity. Furthermore, the future design and implementation of a groundwater perimeter drain and groundwater treatment system, as set forth by the ROD, will address locally trapped DNAPL and groundwater contamination from the MW-19 Area.

These two sets of changed conditions require significant changes to the OU1 remedy and are documented herein. These changes are still expected to meet the specified requirement of FPS containment, achieve the containment remedial action objectives, and address risk to human health and the environment as specified in the OU1 ROD. Furthermore, additional portions of the OU1 remedy, such as the groundwater perimeter drain (collection tile), groundwater treatment system with inward gradient, and engineered cap are anticipated to also contain FPS contaminants upon their upcoming design and implementation.

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

Explanation of Significant Differences

Velsicol Chemical Corporation Superfund Site – Operable Unit 1

I. Introduction

A. Site Name and Location

The Velsicol Chemical Corporation Superfund Site (the Site) encompasses approximately 100 acres in St. Louis, Michigan. At this Site, a chemical manufacturer operated, experimented with, and manufactured various chemicals from the mid-1930s until it was demolished in 1978. Industrial operations at the plant, which included manufacturing pesticides and fire retardants, resulted in widespread contamination of the former plant site (FPS).

Two main parts of the Site include the FPS and the residential properties that border the FPS; the residential area is referred to as the “adjacent or nearby properties” (Figure 1). The FPS is approximately 51 acres, fenced, and bordered on the south and east by the adjacent or nearby properties, with Washington Avenue (also known as Michigan State Route 46 [M-46]) along its southern edge. Watson Street and North Avenue mark the eastern edge, and the Pine River and Mill Pond form the western and northern boundaries. The adjacent or nearby properties span approximately 12 blocks and are primarily composed of residential properties that lie south and east of the FPS boundary. A small number of commercial properties are also located south of the FPS, along M-46/Washington Avenue.

The U.S. Environmental Protection Agency (EPA) divided the Site into four operable units (OUs; Figure 1):

- OU1—FPS and adjacent or nearby properties, for which remedial design and remedial action activities are in progress.
- OU2—Pine River and Mill Pond sediment adjacent and upstream from the St. Louis hydroelectric dam, for which remedial action activities were completed in 2006.
- OU3—Pine River sediments stretching from the St. Louis hydroelectric dam to approximately 1.25 miles downstream of the dam, for which a Record of Decision (ROD) was signed October 10, 2022. Remedial design activities are near completion with remedial action planned for 2025.
- OU4—Pine River sediments stretching from approximately 1.25 miles downstream of the St. Louis hydroelectric dam to the confluence of the Pine, Chippewa, and Tittabawassee rivers, for which remedial investigation activities are in progress.

There are three naturally occurring unconsolidated geologic deposits sitewide: shallow unit, till unit, and lower unit. Within this document the focus will be on the shallow unit and the underlying till unit. The shallow unit thickness varies between 20 and 30 feet and is composed of fill, alluvium, and lacustrine deposits. Debris (i.e., concrete and metal) is also present within the shallow unit from prior operations. The till unit thickness ranges from 30 to 80 feet and is composed of sandy silt with variable amounts of sand, gravel, and cobbles. The thickness of sand and gravel seams within the till unit range from a few inches to several feet. The lower unit extends from the base of the till unit to the top of bedrock (approximately 280 feet below ground surface) and consists of a series of saturated sands subdivided by the two aquitards.

This Explanation of Significant Differences (ESD) addresses changes to the selected remedy at OU1.

B. Identification of Lead and Support Agencies

The lead agency for the OU1 remedial investigation/feasibility study was the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The EPA is the lead agency for the OU1 remedial design and remedial action and EGLE is the support agency.

C. Statement of Purpose

This document sets forth the basis for changes to two OU1 remedy components – 1) repairing the existing upgradient slurry wall (Figure 2) as part of a vertical barrier wall containment around the FPS and 2) removing the need for the dense nonaqueous phase liquid (DNAPL)/ groundwater collection system extension segment to address the monitoring well 19 area (MW-19 Area).

D. Statutory Basis Issuance of the ESD

Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 C.F.R. § 300.435(c)(2)(i) establish procedures for explaining, documenting, and informing the public of significant changes to a remedy that occur after the EPA has signed a ROD. The EPA is required to issue an ESD when the remedial action to be taken differs significantly from the remedy selected in the ROD but does not fundamentally alter the selected remedy with respect to scope, performance, or cost.

E. Summary of Circumstances Necessitating this ESD

The OU1 ROD (EPA 2012) selects and describes a 14-part remedy to address risks to human health and the environment in this operable unit. This ESD addresses two of the 14 remedy components. The OU1 remedy is a combination of containment, treatment, removal, and municipal wellfield replacement (Table 1). The two remedy components that necessitate this ESD are part of the containment portion of the OU1 remedy. Table 1 also shows the breakdown of all 14 remedy components and indicates the status of each of those components (i.e., completed, in progress, etc.).

The OU1 ROD (EPA 2012) includes installation of a vertical barrier wall surrounding the FPS (remedy component #1 in Table 1). This ESD describes the repair for the upgradient portion of the existing slurry wall (Figure 3), so that the upgradient portion will not need a new wall, while a new sheet pile wall will be installed for the downgradient portion only, along the Pine River. The implementation of an upgradient slurry wall repair with the installation of the downgradient vertical barrier wall will meet the specified requirement of FPS containment with a vertical barrier wall, achieve the remedial action objectives (RAOs), and address risk to human health and the environment as specified in the OU1 ROD. Furthermore, additional portions of the OU1 remedy, groundwater perimeter drain (collection tile) with an inward gradient and groundwater treatment system, as well as the engineered cap will contain FPS contaminants upon their future design and implementation.

The OU1 ROD (EPA 2012) also includes the expansion of the current DNAPL/ groundwater collection system into the MW-19 Area (remedy component #4 in Table 1). This ESD will remove this remedy component, as the source material, DNAPL, in this area was addressed by the Area 1 in situ thermal treatment (ISTT) (remedy component #5 in Table 1) (Figure 4). Furthermore, the future design and implementation of a groundwater perimeter drain and groundwater treatment system, along with the continued operation of the current DNAPL/ groundwater collection system, as set forth by the 2012 OU1 ROD, would also address DNAPL and groundwater contamination from the MW-19 Area while still achieving the containment RAOs.

Further details regarding remedy components #1 and #4 are provided in *Section II, Basis for the ESD*.

F. Agency Determination

In consultation with EGLE, the EPA has reviewed the two proposed changes in the selected OU1 remedy. The review has considered the standards set forth in CERCLA and the NCP as well as relevant EPA policies and guidance. Additionally, the EPA and EGLE have reviewed the associated and relevant investigations and evaluations including those since the OU1 ROD (EPA 2012). The changes to 2 of the 14 remedy components are significant, but the changes do not fundamentally alter the selected remedy with respect to scope, performance, or cost.

These changes comply with the NCP and the statutory requirements of CERCLA. The OU1 remedy remains protective of human health and the environment as the OU1 remedy will continue to meet the following RAOs:

- Eliminate offsite migration of DNAPL to prevent the contamination of the surface water and recontamination of sediments of the Pine River.
- Prevent ingestion, inhalation, and direct contact of site-related contaminants of concern (COCs) in groundwater to human and ecological receptors.
- Prevent the migration of site-related COCs from unsaturated and saturated subsurface media to the groundwater or surface water beyond the point of compliance (Figure 2).

For these reasons, it is appropriate for the EPA to issue an ESD to document the changed circumstances resulting in these changes to the remedy and not necessary for the EPA to amend the ROD.

G. Administrative Record

In accordance with the NCP at 40 C.F.R. §§ 300.435(c) and 300.825(a)(2), this ESD and supporting documentation will become part of the Administrative Record (Appendix A) for the Site.

The Administrative Record file and other relevant reports and documents are available online for public review, by appointment only, Monday through Friday between the hours of 8:00 a.m. and 4:00 p.m. at EPA Region 5 office. An appointment may be scheduled at the following location by calling Records Specialist at (312) 886-4465:

EPA Region 5 Records Center
77 West Jackson Boulevard – 7th Floor
Chicago, IL 60604

The Administrative Record is Record is available online at www.epa.gov/superfund/velsicol-chemical-michigan and available online at the following location:

T. A. Cutler Memorial Library
312 Michigan Avenue
St. Louis, Michigan

H. Site History

Operations

The FPS was used for industrial and chemical operations beginning in the mid-1800s until 1977. Historical operations at the site included a lumber mill, oil refinery, salt-processing plant, and chemical manufacturing plant. Storage facilities for raw and finished products, including warehouses and storage tanks constructed above- and belowground, were also integrated throughout the FPS. Historical documents identify several lagoons that are either known or presumed to be associated with waste-disposal practices. In 1935, Michigan Chemical Corporation purchased the property and operated a chemical manufacturing business. In 1965, Velsicol Chemical Corporation gained a controlling interest in Michigan Chemical Corporation. The chemical company manufactured a wide variety of products at the FPS from 1936 through 1977, including the following: various salts; magnesium oxide; rare earth chemicals; dichlorodiphenyl trichloroethane (DDT); and fire retardants, including polybrominated biphenyl (PBB) and tris(2,3-dibromopropyl)phosphate (TRIS).

PBB Chemical Disaster

In early 1973, both PBB (sold under the trade name FireMaster) and magnesium oxide (a cattle feed supplement sold under the trade name NutriMaster) were produced by the Michigan Chemical Company. A shortage of preprinted paper bag sacks led to an estimated 10 to 20 unlabeled 50-pound bags of PBB (FireMaster), instead of NutriMaster, accidentally being sent to the Michigan Farm Bureau Services for distribution to local farmers to augment their feed supply. The accident was not recognized until long after the bags had been shipped to feed mills and used in the production of animal feed. By the time the error was discovered in April 1974, PBB had entered the food chain through human consumption of milk and other dairy products, beef products, and contaminated swine, sheep, chickens, and eggs. As a result of this incident, over 500 contaminated Michigan farms were quarantined, and approximately 30,000 cattle, 4,500 swine, 1,500 sheep, and 1.5 million chickens were destroyed, along with over 800 tons of animal feed, 18,000 pounds of cheese, 2,500 pound of butter, 5 million eggs, and 34,000 pounds of dried milk products.

In 1977, production operations at the FPS were terminated. Following plant closure, in 1978 Velsicol Chemical Company decommissioned the facility, which included the demolition of all aboveground structures and subsequent burial of building debris, rail lines, storage tanks and process piping.

Consent Judgment and Original Remedy

In 1982, the United States of America and the State of Michigan negotiated and entered a Consent Judgment with Velsicol Chemical Corporation for the FPS and the former burn area (now known as the Velsicol Burn Pit Superfund Site). The 1982 Consent Judgment gave Velsicol Chemical Corporation a release from any liability under CERCLA, the Resource Conservation and Recovery Act, and state environmental laws for the Site, with a limited reopener. Pursuant to the Consent Judgment, Velsicol Chemical Corporation submitted plans and specifications for construction and installation of a containment system. The containment strategy consisted of a 2-foot-thick low permeability slurry wall around the 51-acre FPS and the installation of a cap to control water infiltration. The underlying glacial till acts as a confining layer (barrier) to limit the downward migration of contaminants. The slurry wall was set back approximately 50 to 140 feet from the bank of the Pine River and groundwater was to be maintained inside the slurry wall to a specified elevation.

Per the Consent Judgment, the requirements of the containment system to be implemented by the Velsicol Chemical Corporation were:

- Construct a slurry wall around the entire 51-acre boundary of the FPS and keyed to a minimum of 30 inches into the underlying clay till unit to achieve a permeability of 1×10^{-7} centimeters per second (cm/s).
- Maintain groundwater levels inside the slurry wall and beneath the cap to no greater than 724.13 feet above mean sea level. The specified elevation was based on water level measurements in 14 onsite wells.
- Build a cap 36 inches thick over the FPS and compacted to achieve a permeability of 1×10^{-7} cm/s.
- Consolidate and place approximately 68,000 cubic yards of waste material, excavated from the former burn pit area, under the FPS cap.

Ownership

Tasks specified in the Consent Judgment were completed by 1986. Also in 1986, in a complicated confidential buyout arrangement, Velsicol Chemical Corporation transferred ownership of the FPS to a Fruit of the Loom subsidiary, NWI Land Management. Fruit of the Loom agreed to assume 100 percent of the liability for the FPS previously owned by Velsicol Chemical Corporation in an Assumption and Indemnity Agreement. Velsicol Chemical Corporation continued to manage the FPS for Fruit of the Loom under a contract with NWI Land

Management until Fruit of the Loom filed for bankruptcy in 1999, after which NWI Land Management took over management of the FPS. After the 1999 bankruptcy filing by Fruit of the Loom, the EPA learned that Fruit of the Loom's subsidiary owned the FPS, not Velsicol Chemical Corporation. In 2002, a bankruptcy settlement vested title to the FPS in a newly established Custodial Trust. In 2023, ownership transferred to the Michigan State Land Bank Authority, which currently holds the property title.

I. Contaminants of Concern

At the Site, the COCs are a combination of various volatile organic compounds, semi-volatile organic compounds, pesticides, total polychlorinated biphenyls, and DNAPL (as a contaminant source) found in OU1 soil and groundwater. COCs for the FPS are listed in Table 2. Chemicals identified as COCs were found to be risk drivers with cancer risks greater than 1×10^{-4} and/or a Hazard Index greater than 1 as a result of the quantitative risk assessment. The potential receptor groups considered for the FPS included future residents, future commercial and industrial workers, future construction workers and future recreational users of the area. Cancer risks and non-cancer hazards from exposure to contaminated soil and groundwater at the FPS were estimated for each soil sampling location and monitoring well location. Additional details, and calculations about individual COCs or screening criteria, are presented in the 2012 OU1 ROD.

DNAPL is a source material and principal threat waste at the Site and found in both soil sampling locations and monitoring wells. DNAPL is one of a group of organic chemicals that is relatively insoluble in water and, because it is heavier than water, it sinks vertically through aquifers. Two types of DNAPL are present at the Site and both contain several chemical constituents. One type of DNAPL onsite contains very high concentrations of 1,2-dichloroethane mixed with a large number of identified and unidentified brominated compounds, including PBB, hexabromobiphenyl (HBB), 1,2-dibromo-3-chloropropane (DBCP), and TRIS. A second type of DNAPL present at the Site includes high concentrations of chlorobenzene mixed with DDT and its isomers dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethene (DDE). DNAPL is present in Site soils and groundwater and the constituents listed above are COCs in both media. The groundwater also contains a by-product of DDT production called parachlorobenzene sulfonic acid (pCBSA), which is also a COC in the groundwater.

J. Selected Remedy

The OU1 ROD (EPA 2012) selects a remedy that requires the implementation of 14 components to address the FPS and the adjacent or nearby properties. The OU1 remedy is a combination of containment, treatment, and municipal wellfield replacement. The components work in concert to address risks to human health and the environment at the Site. Source materials constituting principal threats at the Site are addressed through a combination of ISTT, in situ chemical oxidation, and offsite disposal. Table 1 shows the remedy components that have been implemented, those in progress, and those to be implemented.

The selected remedy includes the following 14 components:

1. Installation of a vertical barrier surrounding the FPS to decrease the potential for DNAPL and dissolved-phase contaminants to directly discharge to the Pine River from the shallow unit.
2. Installation of a perimeter drain system to capture contaminated groundwater from the shallow unit for treatment and to maintain an inward hydraulic gradient.
3. Continued operation of the existing DNAPL/groundwater collection system to capture DNAPL and contaminated groundwater migrating from the shallow unit and prevent recontamination of the Pine River and sediments.
4. Installation of an additional DNAPL/ groundwater collection system segment to address possible DNAPL and groundwater contamination from the MW-19 area.
5. Implementation of ISTT to address the two DNAPL-contaminated areas. The ISTT system would be operated until the maximum practical volume of DNAPL, defined as 95 percent of the theoretical volume, is achieved. The primary objective for ISTT implementation is to reduce the potential for mobile DNAPL within the FPS to re-contaminate the sediments of the Pine River and prevent migration into the lower unit.
6. Collection of DNAPL in the lower unit (100 feet below ground surface) near the WMW-48 location through use of a collection sump and transportation of collected fluids offsite for incineration.
7. In situ chemical oxidation, or excavation with offsite disposal, of up to four potential source areas (75,090 cubic yards). Two potential source areas will be excavated (42,939 cubic yards) to the soil saturation concentration for soils (Csat) with subsequent offsite disposal. Two potential source areas (32,151 cubic yards) with groundwater contamination greater than their respective water solubility concentrations will be treated by in situ chemical oxidation until the concentration of COCs are below their respective water solubility concentrations.
8. Installation of an engineered cap meeting the requirements of Subtitle C of the Resource Conservation Recovery Act and Part 111 of the Michigan National Resources and Environmental Protection Act to eliminate the direct contact threat and prevent infiltration.
9. Replacement of the City of St. Louis, Michigan, municipal water supply to avoid increased, non-cost-effective long-term groundwater extraction and treatment costs.

10. Restoration of groundwater to drinking water standards outside the point of compliance and technical impracticability (TI) waiver zone, and containment within the point of compliance (POC) through groundwater extraction and treatment (see Figure 2 for locations).
11. Excavation and offsite disposal of soils exceeding 5 parts per million (ppm) total dichlorodiphenyl trichlorethane (DDT); 1.2 ppm polybrominated biphenyl (PBB), and 4.4 ppm TRIS in the adjacent and nearby properties to address risk to human health and the environment. Excavated properties will be backfilled with clean fill and restored.
12. Monitoring well installation and groundwater monitoring program.
13. Site restoration.
14. Institutional controls such as a restrictive covenant, an ordinance restricting groundwater use near the Site, continuing fish advisories, and appropriate signage.

This ESD addresses changes to OU1 remedy component #1 and removal of the need for remedy component #4 and are detailed in *Section II, Basis for ESD*.

As described in the OU1 ROD, due to the presence of DNAPL directly under the Pine River, the EPA found that it is appropriate to waive certain applicable or relevant and appropriate requirements (ARARs) as described below based on Tl from an engineering perspective as authorized under CERCLA Section 121 (d)(4)(C). The TI Waiver Zone, as shown in Figure 2, includes the area adjacent to the FPS that is directly under the Pine River including the Mill Pond and applies to the selected remedy. The TI Waiver was due to DNAPL that is present in sand seams within the till unit and the DNAPL cannot be fully delineated or treated due to its location under the Pine River. The site conditions and information pertaining to the basis for the Tl Waiver are documented in *Technical Impracticability of Groundwater Restoration, Velsicol Chemical Superfund Site, St. Louis, Michigan* (CH2M 2012) and the TI Waiver is discussed on Pages 37 and 60-61 of the OU1 ROD. The ARARs that do not apply to the TI Waiver Zone are the maximum contaminant limits under the Safe Drinking Water Act, 40 CFR § 141.61 (maximum contaminant levels for organic contaminants), 40 CFR § 141.62 (maximum contaminant limits for inorganic contaminants), 40 CFR § 141.66 (maximum contaminant limits for radionuclides), Michigan Administrative Rules 299.5701-299.5752; and Michigan Administrative Rules 325.10601-325.10604 (State Drinking Water Standards and Analytical Techniques).

The Feasibility Study (Weston 2011) detailed analysis and the ROD (EPA 2012), Alternative – 3 (Selected Remedy) was determined to be in compliance with ARARs. Therefore, the changed OU1 remedy, with a repair of the upgradient slurry wall and removal of the MW-19 Area DNAPL collection system extension, would still be in compliance with ARARs.

II. Basis for ESD

This ESD presents significant changes to two OU1 remedy components, #1 and #4, as presented in the OU1 ROD and repeated in *Section I*, the numbered list in *Section J*, and Table 1. Changed conditions, as documented in associated investigations, evaluation technical memoranda, and summary reports for these two remedy components (inclusion of an upgradient slurry wall repair and removal of the DNAPL/ groundwater collection system extension in the MW-19 Area) are detailed below.

A. Upgradient Slurry Wall Repair

As specified in the OU1 ROD, the vertical barrier wall remedy component includes the following fundamental details:

1. Install vertical barrier around the entire perimeter of FPS.
2. Decrease potential for DNAPL and dissolved phase COCs to discharge to Pine River.
3. Use a vertical barrier technology; sealed sheet piling is presented as a "representative technology" in the OU1 ROD.
    a. Located outside current slurry wall and current groundwater collection trench.
    b. Installed 10 feet into the top of the till unit.
    c. Backfill placed between riverbank and sealable sheet piling.

These three core elements of the vertical barrier remedy component will remain. Bullets #2 and #3 apply only to the downgradient portion of the FPS that is along the Pine River. The "representative technology" was presented in the ROD for discussion and construction cost estimation. However, the construction method/vertical barrier technology is not specified in the ROD, thereby allowing selection of the vertical barrier technology to be determined during the remedial design phase. The EPA divided the current vertical barrier wall, the FPS-surrounding slurry wall from 1982 Consent Judgment original remedy, into upgradient and downgradient sections. The downgradient slurry wall leakage/failure has been demonstrated in various documents (MEC 1997, CH2M 2002, Weston 2006, 2009) and is currently being addressed with the implementation of the vertical barrier wall (combination sealed sheet pile wall) as designed in the *Final Basis of Design Report for the Downgradient Vertical Barrier Wall* (CH2M 2023a).

Changed Condition

During detailed analysis of the shallow unit groundwater system completed as part of the remedial design investigations (CH2M 2017), the EPA noted that shallow unit groundwater elevations in the vicinity of the upgradient slurry wall indicated that its presence was impacting groundwater flow (i.e., ability to allow the formation of a groundwater mound), in agreement with the conclusions and groundwater flow maps presented in the remedial investigation report. Based on those conclusions, the EPA, with concurrence from EGLE, began the extensive data collection in 2019 and 2022 to evaluate the upgradient slurry wall.

The EPA conducted two detailed investigations of the upgradient slurry wall to supplement the limited investigation and evaluation of the upgradient slurry wall completed by the State of

Michigan during the remedial investigation (Weston 2006, 2009). New information the EPA obtained through the 2019 and 2022 investigations, combined with changes to the groundwater hydrology since the shutdown of the municipal drinking water supply wells (2014 – 2015), obligated the Agency to reevaluate the upgradient portion of the implementation of a vertical barrier as presented in the 2012 OU1 ROD.

These findings represent a refined and improved understanding of the existing condition of the upgradient slurry wall and, based on multiple lines of evidence, represent a changed condition since the 2012 OU1 ROD. A summary of upgradient slurry wall investigation results and subsequent groundwater modeling provided a basis for the EPA's reevaluation of the upgradient vertical barrier implementation and supports reuse of the current upgradient slurry wall with repair.

Lines of Evidence

A multiple lines of evidence approach was used to collect information and draw conclusions for the upgradient slurry wall. These lines of evidence are summarized in Table 3 with additional figures in Appendix C. Documents containing and detailing the multiple lines of evidence information are contained in the upgradient slurry wall remedial design investigations (CH2M 2020, 2023c), groundwater flow model update (CH2M 2023b), and remedial investigation efforts (Weston 2006, 2009).

The two recent upgradient slurry wall investigations were conducted to evaluate the condition of the approximately 3,100 linear feet of the upgradient slurry wall bordering state highway M-46 and the adjacent or nearby properties (CH2M 2020, 2023c). The results were based on the seven lines of evidence, summarized in Table 3 and discussed below, and indicate that the upgradient slurry wall is able to function as part of the vertical barrier wall system in most locations evaluated, by acting as a hydraulic barrier for shallow unit groundwater. The seven lines of evidence are as follows:

1. Groundwater flow contours
2. Groundwater elevation measurements
3. Soil boring logs
4. Groundwater analytical data
5. Groundwater modeling
6. Dye Testing
7. Hydraulic conductivity

Groundwater Flow Contours - Shallow unit groundwater flow direction before the slurry wall installation in the early 1980s flowed from the southeast to the northwest through the adjacent or nearby properties through the FPS into the Pine River. The slurry wall installation caused a groundwater divide and groundwater flowed, and continues to flow to this day, to the northeast and to the southwest around the FPS (Figure 3 and Appendix C).

Groundwater Elevation Measurements – Manual and transducer groundwater elevation measurements, as well as local precipitation data, were used for this assessment. Evaluation of the groundwater elevation measurements indicate that the slurry wall retains shallow unit groundwater and that the presence of the slurry wall causes groundwater mounding inside the slurry wall (on the FPS) as there is an outward head differential relative to the slurry wall. This means that groundwater elevations inside the wall are greater than the groundwater elevations outside the upgradient slurry wall except at one location. The one exception is a 20-foot leakage area, or breach, between soil borings CSW-003 and CSW-005 in the vicinity of piezometer cluster 28 (CPZ-28; Figure 3 and Appendix C).

Surrounding the 20-foot breach is an area approximately 350-feet wide between CPZ-30 and CPZ-25 (Figure 3) reflecting substandard hydraulic performance. The substandard performance is defined in this area because inward hydraulic gradients (Appendix C) are observed in piezometer clusters CPZ-27-5 (immediately north of breach area) and CPZ-29 (immediately south of breach area). These inward gradients are likely caused by shallow groundwater inside the FPS discharging through the 20-foot breach, resulting in a depression of groundwater elevations near these locations and diminished localized mounding on the interior side of the slurry wall. The exterior piezometers are unaffected by this process and continue to be a hydraulic barrier. Figure 3 shows the 20-foot breach area and the 350-feet area that will be repaired.

Additionally, the shutdown of the municipal drinking water wells (2014-2015) influenced the Site groundwater and has greatly reduced, and at some locations eliminated, the downward hydraulic gradient previously noted in the subsurface. The significant reduction of downward vertical gradient greatly reduces the ability of contaminants to exit the shallow unit and enter the till unit below the Site.

Soil Boring Logs – Soil borings completed during the investigation show a 3.25-foot-thick sand lens between the bottom of the slurry wall and the top of the till in this 20-foot area between soil borings CSW-003 and CSW-005 and in the vicinity of piezometer cluster CPZ-28. The sand lens observation indicates that the slurry wall is not keyed into the till at this location (Appendix C).

Groundwater Analytical Data – Analytical results from groundwater samples collected in the shallow unit in the adjacent or nearby properties indicate that contamination is not leaving the Site toward the residential properties adjacent to the Site. In addition, COC analytical results from groundwater samples collected adjacent to the upgradient slurry wall breach do not exceed the EPA maximum contaminant limits. This is important given that the current shallow unit hydrogeologic conditions at the Site have been present for at least 30 years and have not resulted in a groundwater plume emanating from the Site due to the slurry wall breach. This data was not available during the development of the 2012 OU1 ROD.

Groundwater Flow Model – The EPA developed the Velsicol groundwater flow model in 2009-2010, updated it in 2016-2017, and refined it again in 2022-2023. The latest update calibrated the model to groundwater levels averaged over 2018 to 2022 at 335 well locations as well as updated aquifer properties using data from the recent upgradient slurry wall investigations.

The EPA performed detailed groundwater modeling to evaluate groundwater flow on the upgradient portion of the Site under 3 scenarios (upgradient vertical barrier wall installed; slurry wall breach repaired; upgradient slurry wall left as is) and the effect each would have on flow rates to the (future) groundwater remediation/treatment system. Results show minimal groundwater flow differences between the scenarios. Specifically, results indicated that repairing the breach or installing a vertical sheet pile wall would only change the combined flow rate from the remediation system by less than 1 gallon per minute (Table 3 and Table 4).

Dye Testing – Dye testing was conducted during both recent slurry wall investigations (CH2M 2020, 2023). Lab results from the first dye test indicated that there was an absence of dye outside the upgradient slurry wall in 8 of the 9 exterior piezometers. The one piezometer with dye was located at CPZ-26. which is the area adjacent to the breach with substandard hydraulic performance. The second dye test confirmed the groundwater flow anomalies measured in and around the 20-foot breach and the surrounding 350-foot substandard performance area (Table 3).

Hydraulic Conductivity – Five upgradient slurry wall samples were collected in 2019 and six upgradient slurry wall samples were collected in 2022 for hydraulic conductivity analysis. The hydraulic conductivities ranged from 1.70 x 19^{-8} cm/s to 7.48 x 10^{-6} cm/s. Of these samples, one was in the 10^{-6} cm/s range, three were in the 10^{-7} cm/s range, and the remaining seven samples were in the 10^{-8} cm/s range. A total of 10 of the 11 hydraulic conductivity values are consistent with permeability standards (10^{-7} cm/s) established by the 1982 Consent Judgment and are representative of values for engineered low-permeability layers (Table 3 and Appendix C).

Repair Technology

Since a majority of the upgradient slurry wall is performing adequately, the 20-foot breach and surrounding 350-foot substandard performance area may be repaired in lieu of installing a steel sheet pile wall along the entire 3,100 linear foot upgradient alignment of the slurry wall. Various technologies are available for repair of the upgradient vertical barrier wall. With respect to repairing the current slurry wall versus installation of a new steel sheet pile vertical barrier wall, the upgradient slurry wall repair would be easier and quicker to implement, more effective long-term, and cost approximately one-twentieth what a new sheet pile wall would cost (see Table 5).

An engineering evaluation (CH2M 2024) was conducted and assessed six repair methods. Implementability, effectiveness, design life, and cost were evaluated for each method. Based on that evaluation, the technology to repair the upgradient slurry wall is soil mixing. An upgradient slurry wall repair remedial design will provide further details and specifications regarding the design method and is estimated to be completed in calendar year 2024.

The representative repair technology, soil mixing, typically uses large diameter augers mounted on a hollow stem spindle attached to an excavator or crane to mix soil with cement grout, bentonite slurry, clay slurry, or other stabilizing reagent slurries to install continuous subsurface soil-cement walls for excavation support and groundwater or underground pollutants. In all cases, the soil's compressibility is increased and hydraulic conductivity is reduced during this process. The implementability is high as materials and equipment are readily available and can be installed along the alignment of the existing slurry wall. Placement would provide isolation of the FPS after soil mixing has cured. Furthermore, the soil mixing columns, once cured, are highly effective long term and the anticipated design life of the soil mixing column is 75 years, minimum. This is the longest duration of the possible repair technologies. Capital costs associated with soil mixing are typically low compared to other slurry wall repair technologies. Finally, proper field quality assurance and quality control during construction is crucial for any of the technologies and must be implemented to verify the repair technology will maintain its seal with the existing slurry wall.

Cost Comparison

The 2012 ROD presents the cost of the entire sealed sheet pile wall, as first presented and detailed in the 2011 Feasibility Study. Based on the information presented in those two documents the upgradient portion of the vertical barrier wall is approximately $11,428,000. This includes construction costs, mobilization and demobilization, contingency, and professional services costs in 2012 dollars. Escalating this cost to 2025 prices, the estimated total for an upgradient vertical barrier wall is approximately $22,627,000. An upgradient slurry wall repair using soil mixing to be constructed in 2025 is estimated at approximately $1,126,000 (CH2M 2023). Table 5 shows this cost comparison.

B. DNAPL in MW-19 Area

The 2012 ROD included the expansion of the current DNAPL/ groundwater collection system to address groundwater contamination and DNAPL potentially present in the MW-19 Area (remedy component #4 in Table 1). This ESD removes component #4 from the selected OU1 remedy.

Changed Condition

Through the 2018 implementation of OU1 remedy component #5, ISTT, there was removal of 51,000 pounds of DNAPL, 607 pounds of groundwater contaminants, and 4,300 pounds of vapor contaminants in the MW-19-adjacent source area, known as Area 1 (Figure 3). Because Area 1 is located immediately upgradient of MW-19, the DNAPL source in that area, significantly reduced through ISTT, represents changed conditions. Therefore, in 2022, the EPA conducted a predesign investigation to characterize the soil, groundwater, and presence/absence of DNAPL in the shallow unit near monitoring well MW-19 (CH2M 2023d).

Lines of Evidence

Several lines of evidence were used to draw conclusions regarding the need for a new DNAPL collection segment. These include:

1. DNAPL Screening
2. Groundwater Sampling
3. Groundwater/DNAPL Level Measurements
4. Soil Sampling

The predesign investigation consisted of the following tasks:

- Installation of soil borings to facilitate subsurface soil characterization, analytical soil sample collection, and NAPL screening.
- Installation of two new monitoring wells to facilitate groundwater sample collection, static water-level monitoring, and NAPL groundwater screening.
- Collection of two rounds of groundwater elevation data and analytical samples from seven select monitoring wells located within the MW-19 Area (April and July 2022).

DNAPL Screening, Groundwater Sampling, and Groundwater/DNAPL Level Measurements - Field observations obtained during the predesign investigation confirmed the absence of widespread DNAPL in the areas surrounding MW-19. Visible DNAPL was encountered and verified by positive DNAPL test kit results in two soil borings (SB004 and SB014, Figure 4) and therefore, at soil boring SB014, a new monitoring well (CMW-19S1) was installed during the investigation. Following the April 2022 installation of CMW-19S1, EPA measured approximately 5 inches of DNAPL in the well during the July 2022 groundwater sampling event. Subsequently, the DNAPL thickness was measured on August 3, 2022, and January 5, 2023, and indicated that the thickness of DNAPL was unchanged. The stable thickness of DNAPL in CMW-19S1 demonstrates that DNAPL volume is stable, not increasing, and likely the result of local residual DNAPL on the till.

Soil Sampling - Given the high spatial density of soil borings advanced during the MW-19 Area predesign investigation and the low frequency of confirmed DNAPL observations, observed NAPL is attributed to isolated occurrences of locally trapped contaminants within or on the till surface with an observed lack of DNAPL continuity (Figure 4).

The results of the predesign investigation were evaluated and the EPA determined that there is not a need to design and install a new section of the DNAPL/ groundwater collection system in the MW-19 Area. Furthermore, this extension is no longer necessary to achieve the RAOs established in the 2012 OU1 ROD.

The future design and implementation of the perimeter drain and groundwater treatment system, remedy components #2 and #10, will also address shallow unit groundwater contaminants and DNAPL that remains at the Site and is expected to achieve the RAOs in the 2012 OU1 ROD. This ESD removes component #4 from the OU1 remedy.

III. State Comments

EGLE has reviewed this ESD and concurred with the changes in the selected remedy. The concurrence letter has been made a part of the Administrative Record.

IV. Statutory Determinations

The EPA has determined that the remedy changes, as documented in this ESD, are in accordance with Section 121 of CERCLA and are protective of human health and the environment. The change complies with federal and state requirements that are applicable and/or relevant and appropriate, the remedy uses permanent solutions to the maximum extent practicable, and the remedy is cost-effective. Since hazardous substances will remain on-site at levels that do not allow for unrestricted use and unlimited exposure, five-year reviews of the remedy are required.

V. Public Participation Compliance

In accordance with Section 117(d) of CERCLA, 42 U.S.C. Section 9617(d) and Section 300.435 of the NCP, 40 CFR Section 300.435, EPA published a public notice in the newspaper informing the public of the availability of the proposed ESD for review and comment. EPA provided the public an opportunity to comment on the changes described in the proposed ESD. A thirty (30) day public comment period was also established. EPA's responses to comments received during that period are documented in the Responsiveness Summary, Appendix D.

This ESD, and the documents which form the basis for the decision to modify the ROD are part of the administrative record maintained for the Site in accordance with Section 300.825(a)(2) of the NCP. This ESD will also be placed in the Administrative Record and information repositories, which are located at the T. A. Cutler Memorial Library and in the EPA Region 5 Records Center as required by the NCP at 40 C.F.R. § 300.435(c)(2)(i)(A). See Section I, subsection G, of this ESD for further details about the information repositories. An electronic copy of this ESD will be available online at https://www.epa.gov/superfund/velsicol-chemical-michigan.

VI. Declaration by the EPA

The EPA has determined that the changes to the OU1 remedy, the repair of the upgradient slurry wall and removal of the MW-19 Area DNAPL collection trench, meet the conditions set forth in the ROD. These changes are significant but do not fundamentally alter the overall remedial action for OU1. For the reasons set forth above, EPA issues this ESD for the Velsicol Chemical Corporation Superfund Site.

X DOUGLAS BALLOTTI

Digitally signed by DOUGLAS BALLOTTI
Date: 2024.09.25 08:59:22 -05'00'

Douglas Ballotti, U.S. EPA Region 5
Director, Superfund & Emergency Managem...

VII. References

CH2M HILL, Inc. (CH2M). 2024. *Engineering Evaluation of Methods to Repair the Upgradient Slurry Wall Leakage Area. Velsicol Chemical Corporation Superfund Site*. March 14.

CH2M. 2023a. *Final Basis of Design Report. Remedial Design of the Velsicol Chemical Corporation Superfund Site. Downgradient Vertical Barrier* Wall, *St Louis, Michigan*. September.

CH2M. 2023b. *Velsicol Groundwater Flow Model 2023 Update. Velsicol Chemical Corporation Superfund Site St. Louis, Michigan.* September.

CH2M. 2023c. *Technical Memorandum – Supplemental Upgradient Slurry Wall Investigation*, *Velsicol Chemical Corporation/Pine River Superfund Site, St. Louis, Michigan*. August.

CH2M. 2023d. *MW-19 Area Investigation Technical Memorandum*. *Velsicol Chemical Corporation Superfund Site*. March 15.

CH2M. 2020. *Data Evaluation Report. Velsicol Former Plant Site. Upgradient Slurry Wall Investigation. St. Louis, Michigan*. August.

CH2M. 2017. *Remedial Design Investigation Report. Velsicol Chemical Corporation Superfund Site. Former Plant Site Remedial Design Groundwater Characterization, St. Louis, Michigan.* January.

CH2M. 2012. T*echnical Impracticability of Groundwater Restoration, Velsicol Chemical Corporation Superfund Site, St. Louis, Michigan*.

CH2M. 2002. *Summary of Information Regarding Slurry Wall Velsicol Chemical/Pine River Site St. Louis, Michigan*. January.

Memphis Environmental Center (MEC), Inc. 1997. *Final Containment System Assessment Report: Former Michigan Chemical Plant Site, St. Louis, Michigan*. October.

United States of America and The State of Michigan v. Velsicol Chemical Corporation a Delaware Corporation, Successor-in-Interest to Michigan Chemical Corporation. 1982. *Consent Judgment*. December 27.

United States Environmental Protection Agency (EPA). 2012. *Record of Decision, Velsicol Chemical Corporation/Pine River Superfund Site, Former Plant Site – Operable Unit 1, St. Louis, Michigan*. June 22.

Weston Solutions of Michigan, Inc. (Weston). 2006. *Remedial Investigation Report for Operable Unit One, Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan.* November.

Weston. 2009. *Remedial Investigation Addendum Report for Operable Unit One, Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan*. January.

Weston. 2011. *Feasibility Study Operable Unit One, Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan*. November

Figures

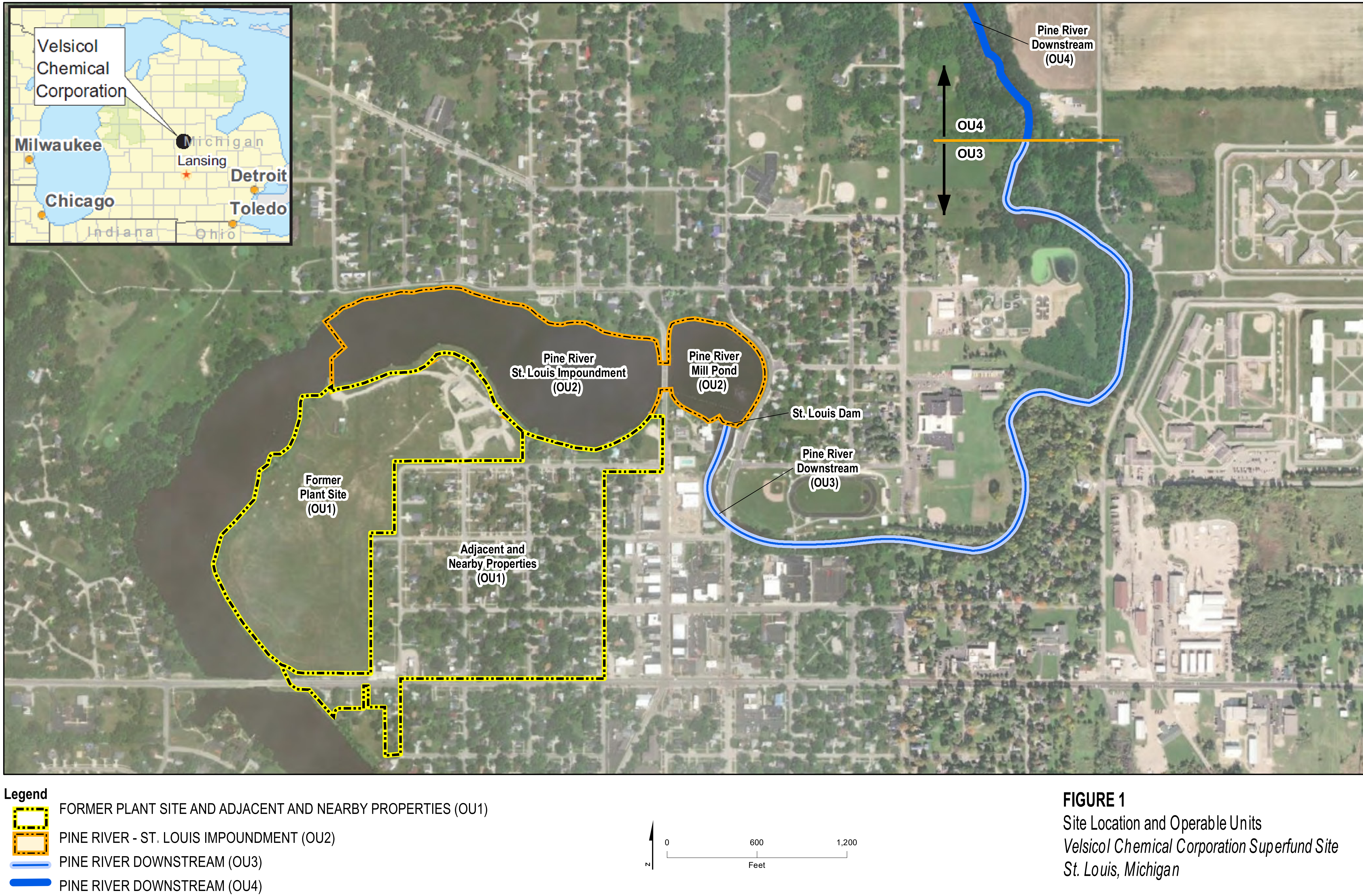


FIGURE 1
Site Location and Operable Units
Velsicol Chemical Corporation Superfund Site
St. Louis, Michigan

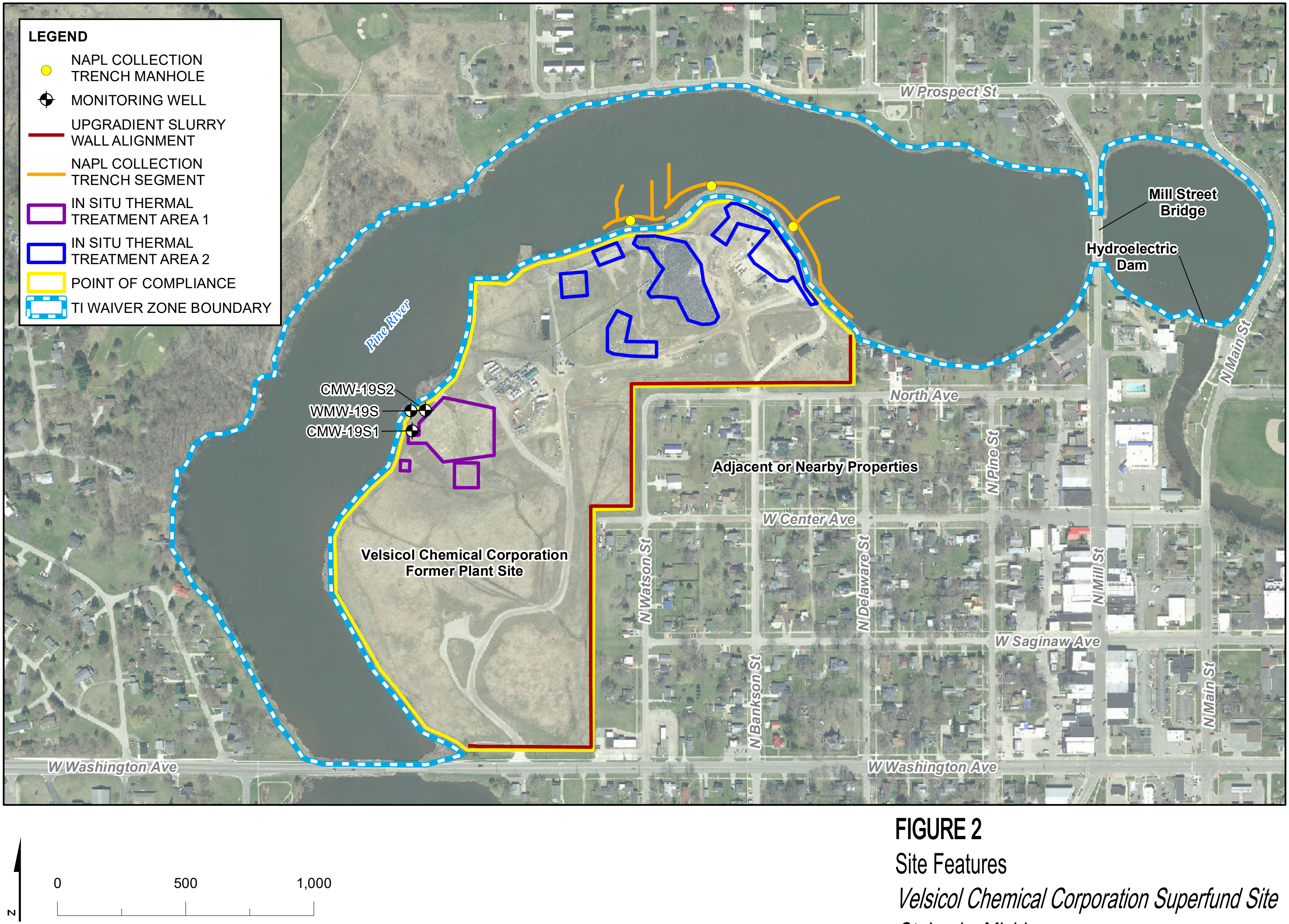


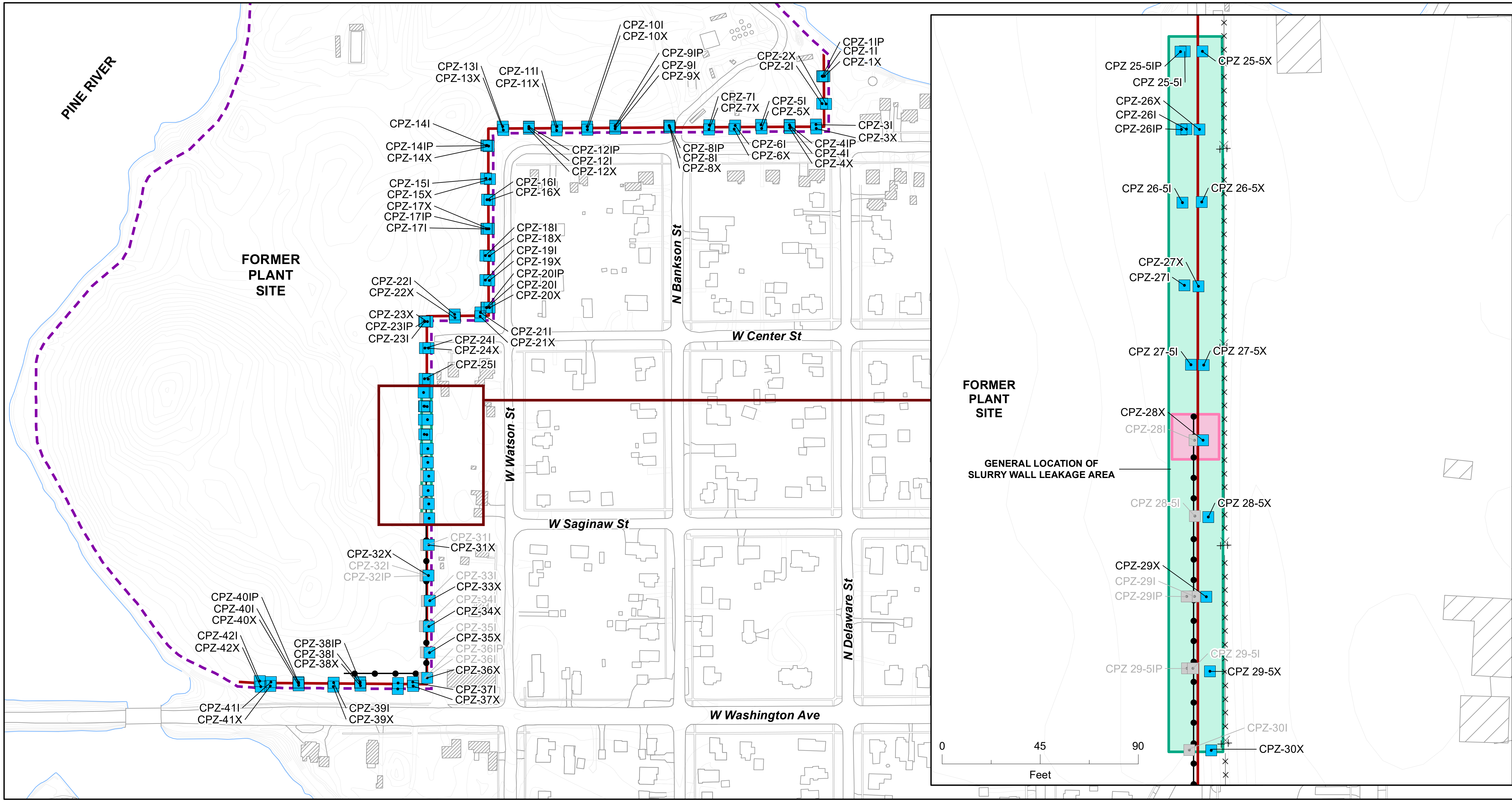
FIGURE 2

Site Features

Velsicol Chemical Corporation Superfund Site

St. Louis, Michigan

\\DC1VS01\GISPROJ\E\EPA\VELSICOL_SUPERFUNDSITE\REPORTS\2022\FI_EXCEEDANCES\MAPFILES\FIGURE02_SITE_FEATURES.MXD AESPEJO 6/5/2024 9:57:16 AM



Legend

- EXISTING PIEZOMETER CLUSTER
- ABANDONED PIEZOMETER CLUSTER
- APPROXIMATE UPGRADIENT SLURRY WALL ALIGNMENT
- APPROXIMATE LOCATION OF POTENTIAL SOURCE AREA 1 EXCAVATION SUPPORT WALL
- APPROXIMATE FENCE ALIGNMENT
- AREA OF SUBSTANDARD PERFORMANCE
- SLURRY WALL BREACH IDENTIFIED BY SLURRY WALL BORINGS
- APPROXIMATE OU1 BOUNDARY

N

0 250 500

Feet

FIGURE 3

Upgradient Slurry Wall Repair Area

Velsicol Chemical Corporation Superfund Site

St. Louis, Michigan

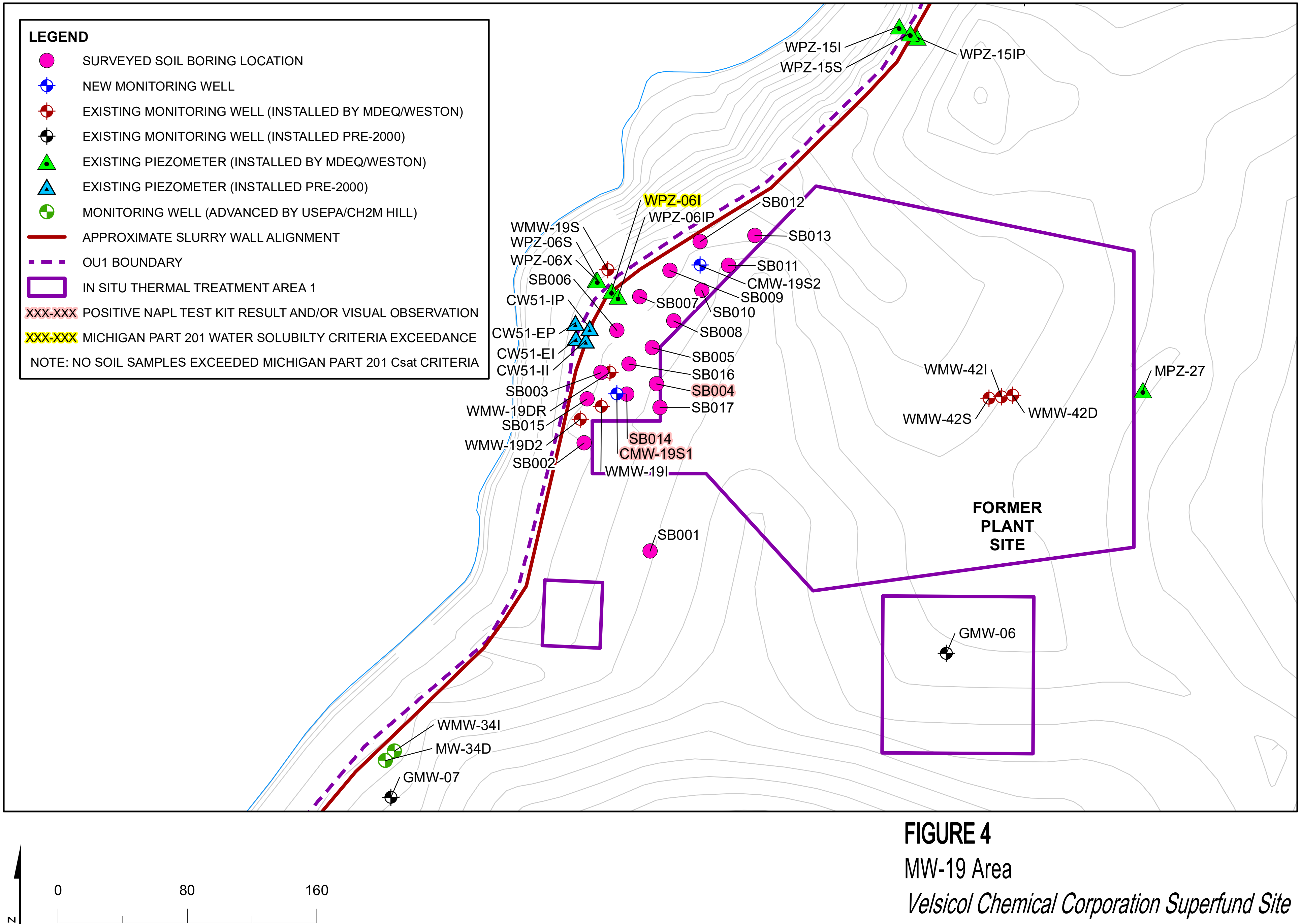


FIGURE 4

MW-19 Area

Velsicol Chemical Corporation Superfund Site

St. Louis, MI

\\DC1VS01\GISPROJ\E\EPA\VELSICOL_SUPERFUNDSITE\REPORTS\2022\FI_EXCEEDANCES\MAPFILES\FIGURE04_MW-19_AREA.MXD AESPEJO 6/4/2024 1:19:19 PM

Tables

Table 1: OU1 ROD Remedy Components
Velsicol Chemical Corporation Superfund Site

Containment	Source Control		Other
	Treatment	Removal	
1. Vertical Barrier Wall 2. Perimeter Drain System 3. Continue operation of existing DNAPL/GWCS **4. DNAPL/GWCS segment in MW-19 Area** 8. Cap 10. Groundwater Pump and Treatment System	5. ISTT for NAPL/DBCP Areas 7. ISCO for PSA-3 and PSA-4	6. DNAPL Recovery from Lower Outwash Unit 7. PSA-1 and PSA-2 Excavation 11. ANP Excavation	9. Replacement of the City of St. Louis Municipal Water Supply 12. Groundwater Monitoring Program 13. Site Restoration 14. Institutional Controls

Notes:

Each number corresponds to each of the 14 remedy components listed in this Explanation of Significant Differences and the Velsicol OU1 Record of Decision (EPA 2012)

ANP – Adjacent and nearby properties
DNAPL – Dense nonaqueous phase liquid
GWCS – Groundwater collection system
ISCO – In situ chemical oxidation
ISTT – In situ thermal Treatment
MW – Monitoring well
PSA – Potential source area

Bold Text – Remedy components addressed in this Explanation of Significant Differences
Green Highlighted Text – Remedy implementation is in progress
Yellow Highlighted Text – Remedy component has been implemented at OU1

Table 2. Summary of Contaminants of Concern as defined in the 2012 OU1 Record of Decision for Former Plant Site Soil and Groundwater
Velsicol Chemical Corporation Superfund Site

Contaminants of Concern (COCs)[1]	Subsurface Soil	Groundwater Shallow On-site	Groundwater Deep On-site
Volatile Organic Compounds (VOCs)			
1,2 Dichloroethane	x		x
1,2 Dichloropropane			x
2 Butanone		x	
Benzene	x	x	x
Chlorobenzene		x	x
Methylene Chloride			x
Toluene		x	
Semi-volatile Organic Compounds (SVOCs)			
Benzo(a)pyrene	x		
Bis(2-ethylhexyl)phthalate			x
Polybrominated biphenyl (PBB)	x		
Tris (2,3 Dibromo-1-propyl) Phosphate (TRIS)	x		x
Pesticides			
Alpha BHC			x
4,4' Dichlorodiphenyldichloroethylene (4,4' DDE)	x		
Total dichloro-diphenyl-trichloroethane (DDT as 4,4' DDT and 2,4' DDT)[2]	x		
Dieldrin	x		
para chlorobenzene sulfonic acid (pCBSA)[2]		x	x
Polychlorinated biphenyls (PCBs)			
Total PCBs	x		
Metals			
Barium			x
DNAPL[3]	x	x	x

Notes:

1. Chemicals identified as COCs were found to be risk drivers (cancer risks >10-4 and/or Hazard Index >1) as a result of the quantitative risk assessment.

2. Para chlorobenzene sulfonic acid (pCBSA) is a a by-product of DDT production

3. DNAPL is a contaminant source. There are two types of DNAPL at the Site. One type of DNAPL contains high concentrations of 1,2-dichloroethane mixed with a large number of identified and unidentified brominated compounds, including PBB, hexabromobiphenyl (HBB), and 1,2-dibromo-3-chloropropane (DBCP). A second type of DNAPL present at the Site includes high concentrations of chlorobenzene mixed with DDT and its isomers dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethene (DDE).

Table 3. Summary of Multiple Lines of Evidence Supporting ESD Changes
Velsicol Chemical Corporation Superfund Site

Line of Evidence	Development Information	Investigative Findings to Support Decision Making	Conclusion	Associated Figures or Tables in this ESD	References
UPGRADIENT SLURRY WALL REPAIR					
1. Groundwater Flow Contours	Review of shallow unit groundwater flow contours before and after the installation of the slurry wall in 1983.	1. Before the installation of the slurry wall: a. Groundwater flow moved towards the Pine River from the southeast to the northwest. b. Groundwater flowed through the adjacent or nearby properties through the Former Plant Site into the Pine River. 2. After installation of slurry wall: a. A groundwater divide formed causing upgradient shallow unit groundwater to flow around the slurry wall and Former Plant Site. b. Groundwater flowed (and continues to flow to this day) from the southeast and splits to the northeast and to the southwest causing groundwater to flow around the Former Plant Site and towards the Pine River.	Offsite groundwater does not flow onto the Former Plant Site.	Appendix C - Figures 1 and 2	MEC 1997; CH2M 2002, 2017, 2012, 2020, 2023b, c, d
2. Groundwater Elevation Measurements	Groundwater elevation measurements have been collected for over 40 years both before and after slurry wall installation. Focused upgradient slurry wall studies in 2019 and 2022 collected manual and transducer groundwater elevation measurements in 54 piezometers.	a. Upgradient slurry wall retains shallow unit groundwater except at one location and the presence of the slurry wall causes groundwater mounding on the Former Plant Site (inside slurry wall). The differential in groundwater elevations show that the one exception is a 20-foot leakage area, or breach, between borings CSW-003 and CSW-005 in the vicinity of piezometer cluster CPZ-28. Surrounding the 20-foot breach is an area approximately 350-feet wide area between CPZ-30 and CPZ-25 reflecting substandard hydraulic performance. b. Shutdown of municipal drinking water wells (2014-2015) influenced the Site groundwater and has greatly reduced, and at some locations eliminated, the downward hydraulic gradient previously noted in the subsurface.	a. Groundwater elevation data indicate the location and extent of the breach and substandard performance area. b. Due to the shutdown of municipal drinking water wells the significant reduction of downward vertical gradient greatly reduces the ability of contaminants to exit the shallow unit and enter the till unit below the Site.	Appendix C - Figures 3, 4, 5, and 6	Weston 2006 & 2009; CH2M 2017, 2020, 2023b, c, d
3. Soil Boring Logs	A total of 48 new piezometer pairs were installed along the upgradient slurry wall alignment. All borings were logged to the till unit.	The soil boring at CPZ-28 showed a 3.25 foot layer of sand between the bottom of the slurry wall (15 ft below ground surface)and the top of the till surface (18.25 ft below ground surface).	The slurry wall was not keyed into the till layer during the 1983 slurry wall installation. This is the location of and the reason for the breach.	Appendix C - Figures 7 and 8	CH2M 2020 and 2023c
4. Groundwater Analytical Data	Analytical Results have been collected from the shallow unit groundwater in the adjacent or nearby properties for at least 30 years.	COC analytical results from shallow unit groundwater samples collected adjacent to the upgradient slurry wall breach do not exceed EPA maximum contaminant levels.	There is no plume emanating from the Site due to the slurry wall breach.	Appendix C - Figure 9	Weston 2006 & 2009; CH2M 2017, 2020, 2023b, c, d

Line of Evidence	Development Information	Investigative Findings to Support Decision Making	Conclusion	Associated Figures or Tables in this ESD	References
5. Groundwater Modeling	A groundwater flow model was developed to simulate groundwater flow beneath and adjacent to the Site and has been updated since 2009. In 2023, the model was updated with the recent groundwater data collected at the new piezometer clusters along the upgradient slurry wall alignment. The 2023 objective is to project the volume of extracted groundwater from a perimeter drain and extraction wells as described in the OU1 ROD, based on three scenarios. The scenarios are: 1) installation of upgradient sheet pile vertical barrier wall 2) repair of slurry wall breach; and 3) current condition of the upgradient slurry wall.	The model simulations based on the updated 2023 flow model show that the combined modeled extraction rates for all three scenarios are nearly equal (less than 1 gallon per minute), and the minor differences results from the perimeter drain flows.	Improvements to the upgradient slurry wall are not projected to reduce remediation extraction rates. The benefit of improving the slurry wall at the breach and substandard performance area would reduce the potential for offsite contaminant migration.	Table 4	CH2M 2023b
6. Dye Testing	As part of the 2019 remedial design investigation, a dye trace data was competed across the 3,100 feet upgradient slurry wall at 15 test locations. A supplemental dye tracer study was completed in 2022 using two unique dyes (fluorescein and sulphorhodamine B) to further evaluate groundwater flow pathways near the previously defined upgradient slurry wall leakage area.	Results from the 2019 remedial design investigation dye tracer study indicated the only area where dye was detected outside the slurry wall was at CPZ-26. The supplemental dye tracer completed near the leakage area indicates that although hydraulic gradients exist between interior and exterior piezometers, which suggests the upgradient slurry wall is acting as a hydraulic barrier, the presence of fluorescein dye at the end of the study in groundwater from piezometer CPZ-26X suggests another area of the upgradient slurry wall leakage may be present near the CPZ-26 cluster. The dye tracer studies completed between piezometer clusters CPZ-25 and CPZ-30 indicates that groundwater will eventually exit the FPS through the upgradient slurry wall leakage area.	Based on collective groundwater elevation measurements inside and outside of the upgradient slurry wall and the dye study results, performance of the upgradient slurry wall over approximately 350 linear feet is degraded specifically between piezometer clusters CPZ-25-5-5 and CPZ-30. The affected 350 foot section includes the breach observed in the vicinity of piezometer cluster CPZ-28.	--	CH2M 2020 and 2023c
7. Hydraulic Conductivity	5 Shelby tube samples were collected in 2019 and an additional 6 were collected in 2022.	Hydraulic conductivities ranging from 10^{-8} cm/s to 10-6 cm/s. Of these samples, one was in the 10^{-6} cm/s range, 3 were 10^{-7} cm/s range, and the remaining 7 samples were in the 10^{-8} cm/s range. Hydraulic conductivity values are consistent with permeability standards established by the 1982 Consent Judgement.	Hydraulic conductivity values are representative of values for engineered low-permeable layers and act as a barrier to groundwater flow.	Appendix C - Figure 10	CH2M 2002, 2020 and 2023c

Line of Evidence	Development Information	Investigative Findings to Support Decision Making	Conclusion	Associated Figures or Tables in this ESD	References
MW-19 AREA - REMOVAL OF NEED FOR DNAPL COLLECTION TRENCH SEGMENT					
1. DNAPL Screening	During intrusive work, if contamination was encountered that looked like DNAPL it was noted on the soil boring and tested with field kits.	DNAPL was encountered and verified in two locations, SB004 and SB014.	New monitoring well installed in the vicinity of the 2 DNAPL occurrences, to measure DNAPL thickness (and thereby mobility/fluctuations) over time.	Appendix C - Figures 11, 12, 13, and 14	CH2M 2023d
2. Groundwater Sampling	Two new monitoring wells were installed and a total of 7 monitoring wells were sampled for this investigation.	Groundwater sampling events in the MW-19 Area were completed in April and July 2022. The April 2022 groundwater sampling collected from WPZ-06I had a HBB concentration of 0.53 ug/L, which is above the water solubility criterion for HBB (0.17 ug/L). The HBB concentration at WPZ-06I was below the water solubility criterion during the July 2022 groundwater sampling event. No other groundwater samples exceeded water solubility criteria during either sampling event.	Groundwater sample analytical data do not show widespread exceedances of the Michigan Part 201 water solubility criteria (2012 ROD groundwater performance standard). This supports the conclusion that DNAPL occurrences are isolated.		
3. Groundwater and DNAPL Measurements	DNAPL was measured at one monitoring well, the new monitoring well, CMW-19SI.	Approximately 5 inches of DNAPL was measured in CMW-19SI at two different dates, August 3, 2022 and January 5, 2023, and the thickness was unchanged.	DNAPL thickness is stable, indicating the DNAPL is likely immobile and an isolated occurrence.		
4. Soil Sampling	17 new soil borings were advanced during this predesign investigation.	High spatial density of the soil borings and low frequency of DNAPL observations.	DNAPL is attributed to isolated or local occurrences within or on the till surface. There is also a lack of DNAPL continuity across the MW-19 Area.		

Table 4. Modeled Remedy Extraction Summary
Velsicol Chemical Corporation Superfund Site

Modeled Flows	**Scenario 1 Existing UGSW with Leakage Area**	**Scenario 2 Repaired UGSW in Leakage Area**	**Scenario 3 Sheet Pile Wall around UGSW**
Perimter Drain	14.8	14.7	13.9
14 Remediation Wells	73.0	73.0	73.0
Sum	87.8	87.7	86.9
Reduction in Flow Relative to Scenario 1	0	0.1	0.9

Notes:

1. Flow values in table are in unit of gallons per minute.

Table 5. Estimated Cost Comparison Between Upgradient Vertical Barrier Wall Implementation and Upgradient Slurry Wall Repair

Velsicol Chemical Corporation Superfund Site

	Total Estimated Cost of Upgradient Barrier Wall[c] ($)	Total Estimated Cost Upgradient Slurry Wall Repair[d] ($)
Cost from Feasibility Study and 2012 OU1 Record of Decision (ROD)[a] (construction costs + mobe/demob + contingency + professional services)	$ 11,428,000	--
Cost from 2012 OU1 ROD with 5% escalation rate[b]	**$ 22,627,000**	--
Cost from Engineering Evaluation Technical Memorandum (2023) [b]	--	**$ 1,126,000**

Notes:

a. Based on 2011/2012 costs in presented Feasibility Study and ROD cost estimates

b. Based on assumed 2025 costs

c. ROD assumes sealed sheet pile wall installation

d. Engineering Evaluation assumes soil mixing for repair

Appendix A

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR THE
VELSICOL CHEMICAL CORPORATION SITE
ST. LOUIS, GRATIOT COUNTY, MICHIGAN

UPDATE 4
SEPTEMBER, 2024
SEMS ID:

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	931741	1/1/17	CH2M HILL	U.S. EPA	Report - Regarding: Remedial Design Investigation - Former Plant Site Remedial Design Groundwater Characterization, St. Louis, Michigan	438
2	960532	8/1/20	CH2M HILL	U.S. EPA	Report - Regarding: Data Evaluation Report, Velsicol Former Plant Site - Upgradient Slurry Wall Investigation - St. Louis, Michigan	178
3	973779	3/1/22	CH2M HILL	Alcamo, T., U.S. EPA	Technical Memorandum - Regarding: MW - 19 Area Investigation Work Plan, Velsicol Chemical Corporation Superfund Site	158
4	980340	3/15/23	CH2M HILL	U.S. EPA	Report - Regarding: MW - 19 Area Investigation Technical Memorandum, Velsicol Chemical Corporation Superfund Site	4057
5	984841	8/7/23	CH2M HILL	Alcamo, T., U.S. EPA	Technical Memorandum - Regarding: Supplemental Upgradient Slurry Wall Investigation, Velsicol Chemical Corporation - Pine River Superfund Site, St. Louis, Michigan	368
6	985290	9/1/23	CH2M HILL	Alcamo, T., U.S. EPA	Report - Regrading: Velsicol Groundwater Flow Model 2023 Update - Velsicol Chemical Corporation Superfund Site, St. Louis, Michigan	60

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
7	985941	3/14/24	CH2M HILL	U.S. EPA	Technical Memorandum - Regarding: Engineering Evaluation of Methods to Repair the Upgradient Slurry Wall Leakage Area, Velsicol Chemical Corporation Superfund Site (Redacted)	27
8	992244	6/17/24	Roos, P., EGLE	Ballotti, D., U.S. EPA	Letter via Email - Regarding: Concurrence with the Explanation of Significant Differences for a Remedy Modification for Operable Unit 1; Velsicol Chemical Superfund Site, St. Louis, Gratiot County, Michigan	2
9	991617	7/1/24	U.S. EPA	Public	Factsheet: EPA Announces Revisions to Cleanup Plan	4
10	990237	7/10/24	U.S. EPA	File	Draft for Public Comment Purposes - Explanation of Significant Differences - Velsicol Chemical Corporation Super Fund Site Operable Unit 1, Saint Louis, Michigan, EPA Site ID: MID000722439	27
11	995180	7/14/24	U.S. EPA	General Public	Newspaper -Homefront Morning Sun: EPA Announces Revisions to Cleanup Plan For the Velsicol Chemical Superfund Site, St. Louis, Michigan	1
12	995172	7/31/24	U.S. EPA	General Public	Public Meeting Announcement: EPA Announces Revisions to Cleanup Plan	1
13	****	****	****	****	ESD *(Pending)*	****

Appendix B

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

EGLE
PHILLIP D. ROOS
DIRECTOR

June 17, 2024

VIA EMAIL

Douglas E. Ballotti, Director
Superfund and Emergency Management Division
United States Environmental Protection Agency
Region 5
77 West Jackson Boulevard (S-6J)
Chicago, Illinois 60604-3507

Dear Douglas E. Ballotti:

SUBJECT: Concurrence with the Explanation of Significant Differences for a Remedy Modification for Operable Unit 1; Velsicol Chemical Superfund Site; St. Louis, Gratiot County, Michigan

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) has received a copy of the Explanation of Significant Differences (ESD) for Operable Unit (OU) 1 at the Velsicol Chemical Superfund Site in St. Louis, Gratiot County, Michigan. The United States Environmental Protection Agency (USEPA) has requested concurrence from the State of Michigan with the ESD for the site.

EGLE concurs with the proposed remedy modifications that necessitate this ESD. These remedy modifications are part of the containment portion of the OU1 remedy and include the repair of the existing upgradient slurry wall as part of a vertical barrier wall containment around the former plant site and the removal of the need for a dense nonaqueous phase liquid/groundwater collection system extension to address the MW-19 Area.

If you need further information, please contact Mike Neller, Director, Remediation and Redevelopment Division, at 517-512-5859; NellerM@Michigan.gov; or EGLE, P.O. Box 30426, Lansing, Michigan 48909-7926; or you may contact me.

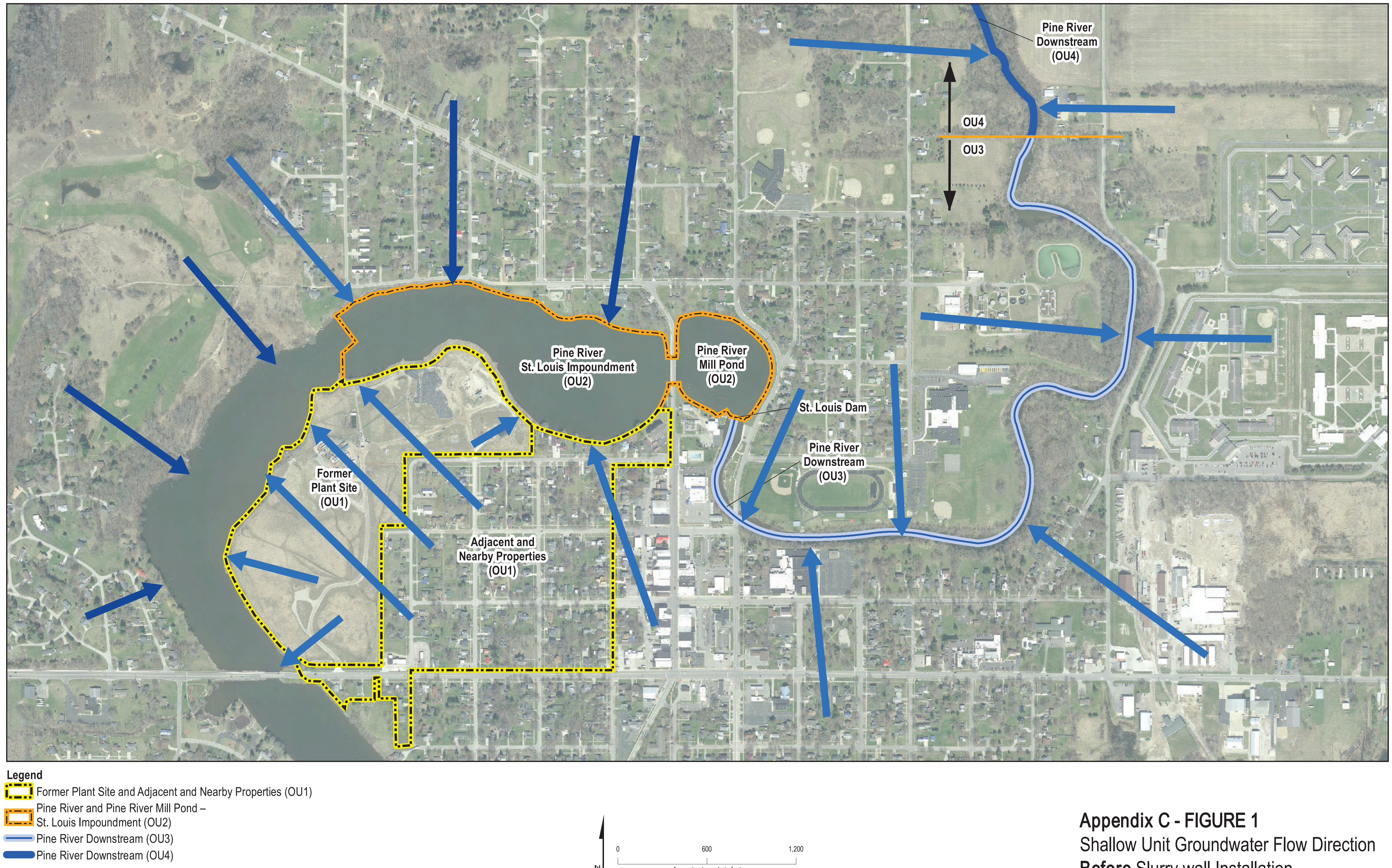
Sincerely,

Phillip D. Roos

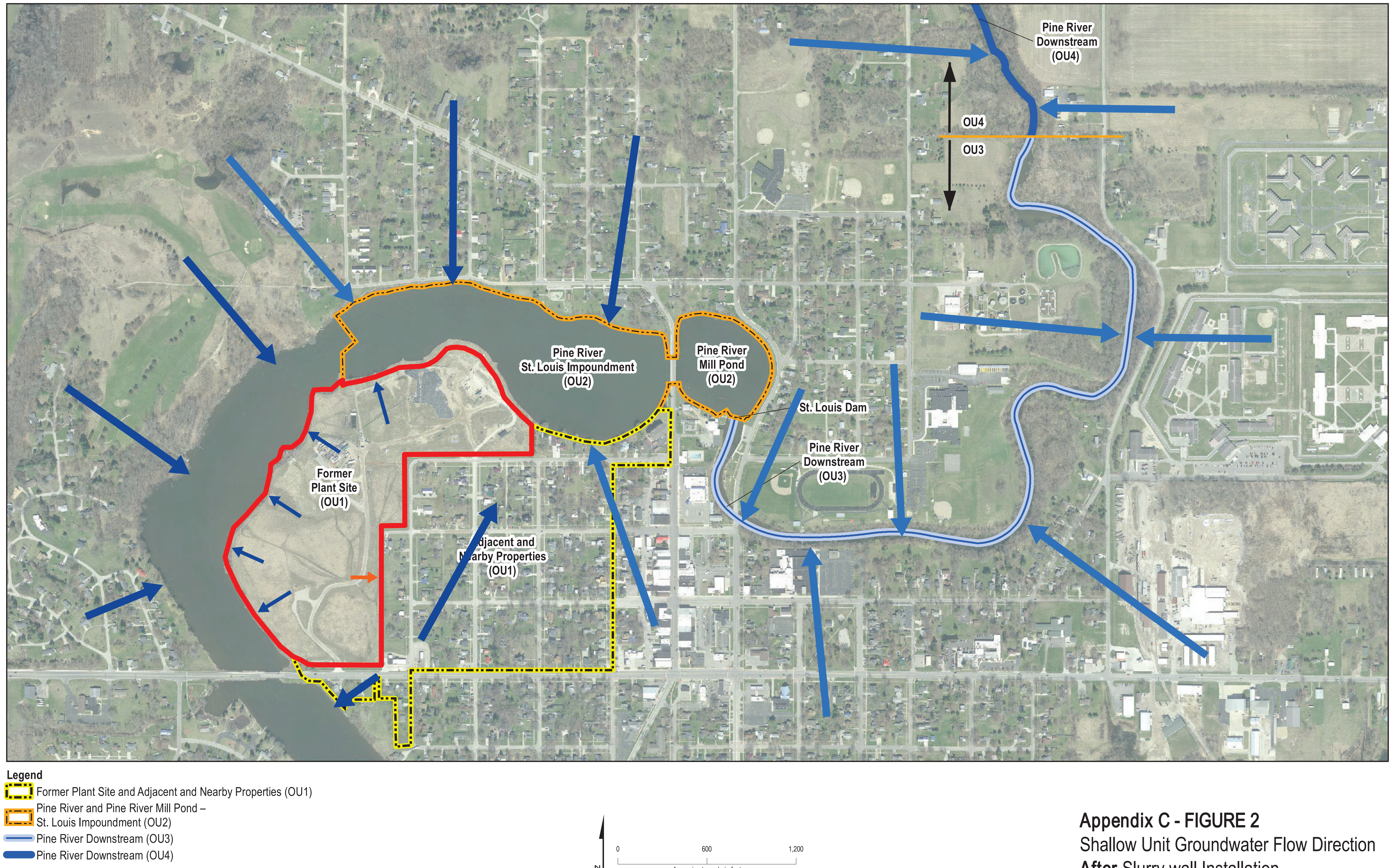
Phillip D. Roos
Director
517-284-6700

cc: Jennifer Knoepfle, USEPA, Region 5
Aaron B. Keatley, Chief Deputy Director, EGLE
Mike Neller, EGLE
Kalan Briggs, EGLE
Robert Franks, EGLE
Matt Baltusis, EGLE

Appendix C



Appendix C - FIGURE 1
Shallow Unit Groundwater Flow Direction
Before Slurry wall Installation
Velsicol Chemical Corporation Superfund Site
Saint Louis, Michigan



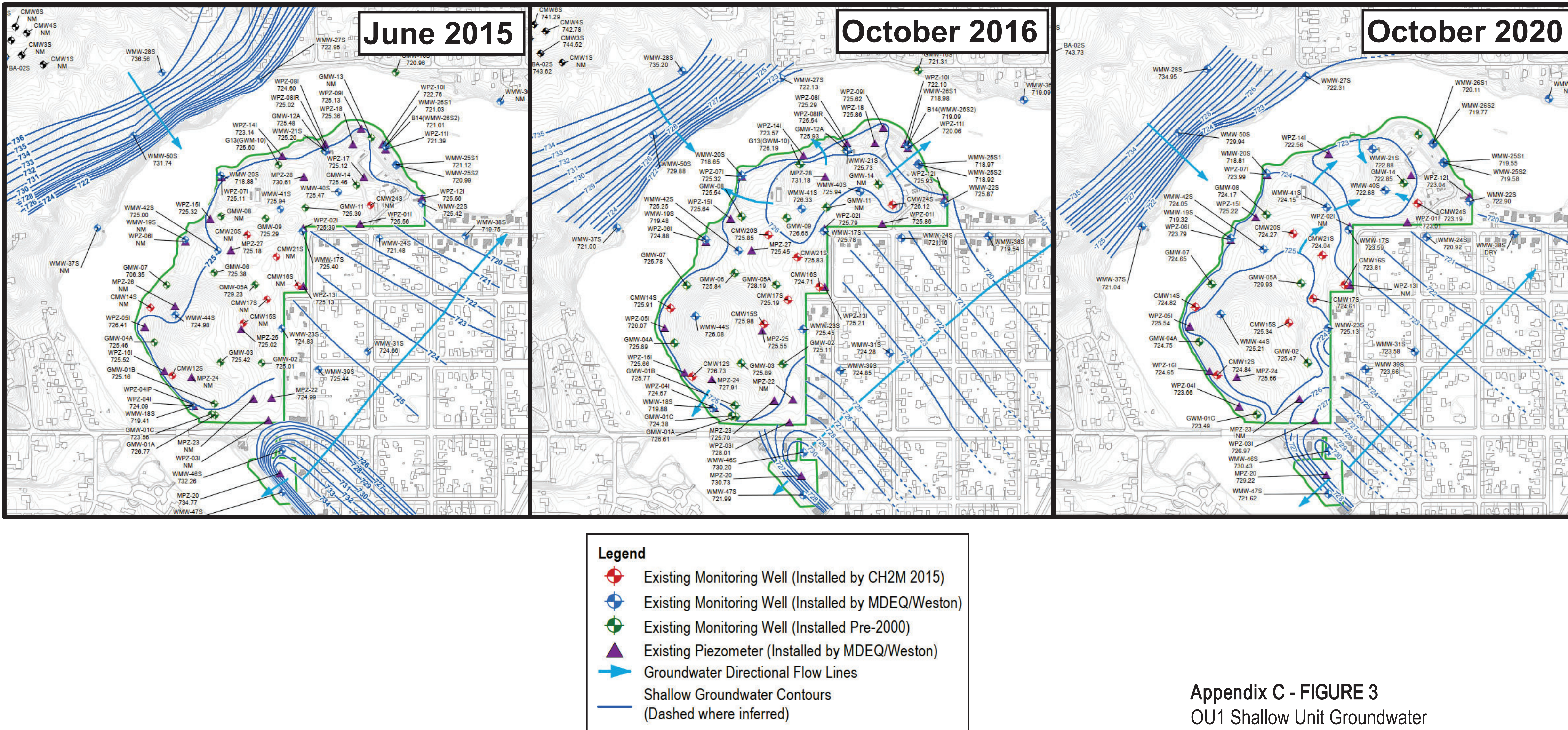
Appendix C - FIGURE 2

Shallow Unit Groundwater Flow Direction

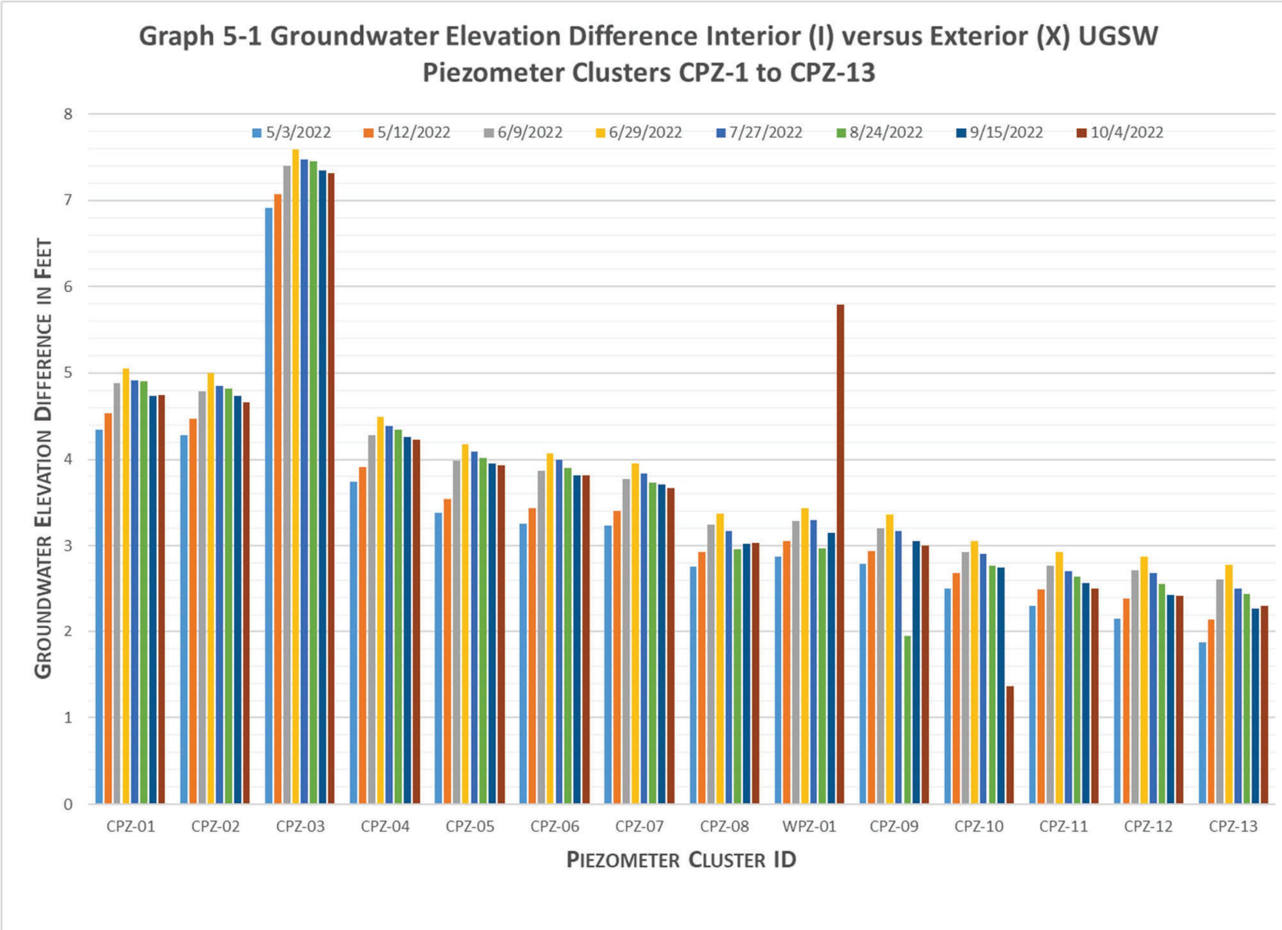
After Slurry wall Installation

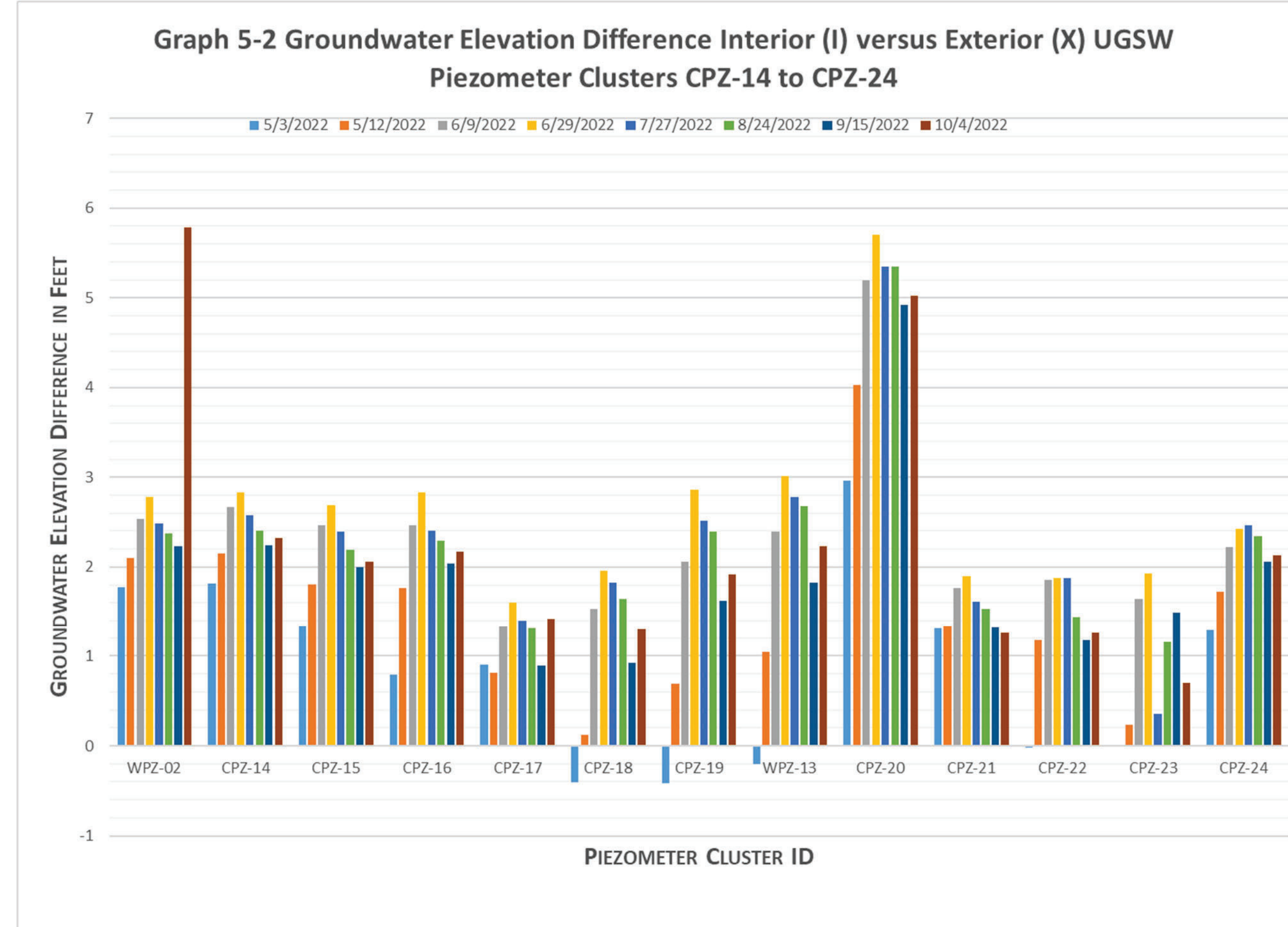
Velsicol Chemical Corporation Superfund Site

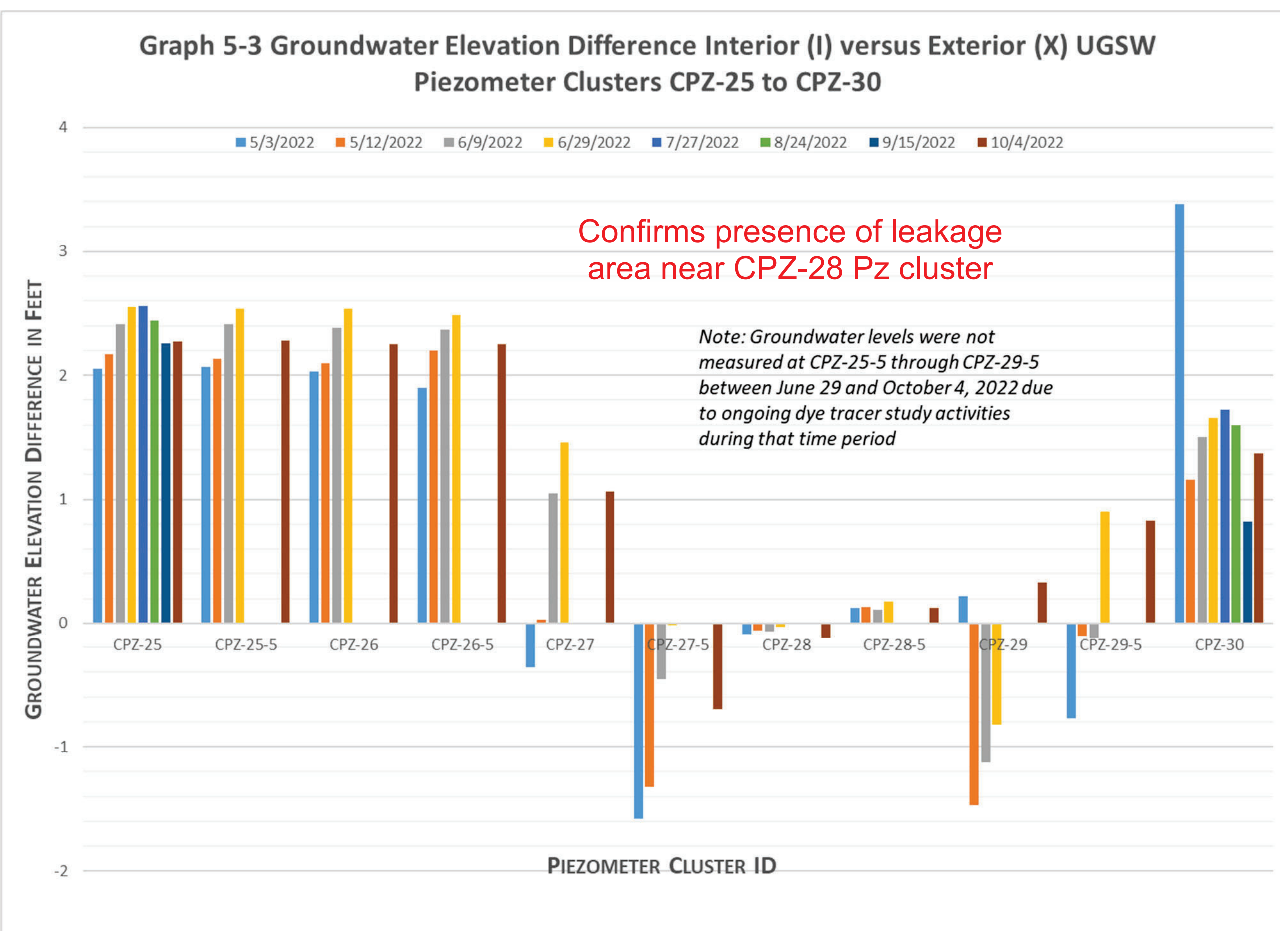
Saint Louis, Michigan

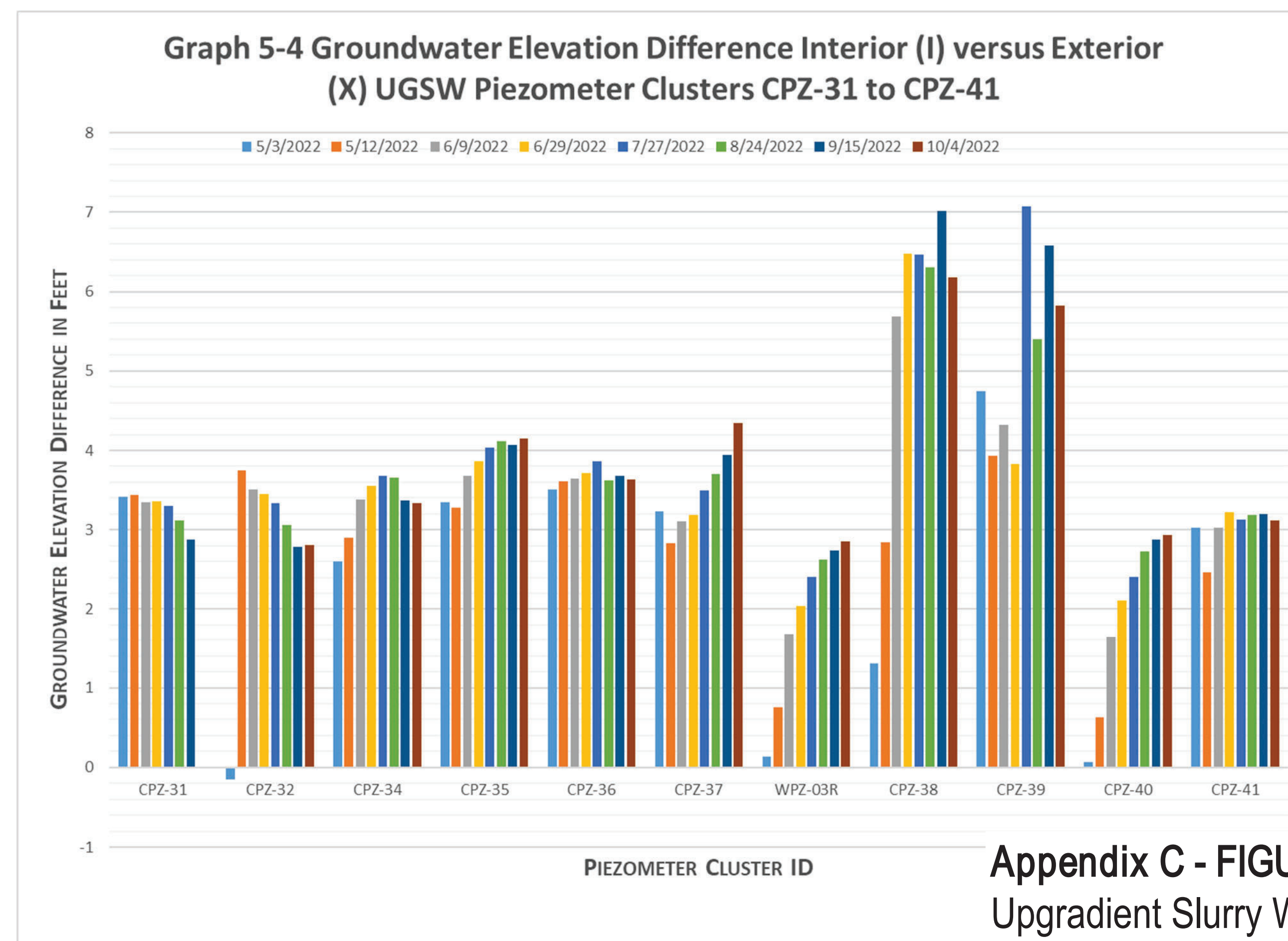


Appendix C - FIGURE 3
OU1 Shallow Unit Groundwater
Elevation Contours
Velsicol Chemical Corporation Superfund Site
Saint Louis, Michigan



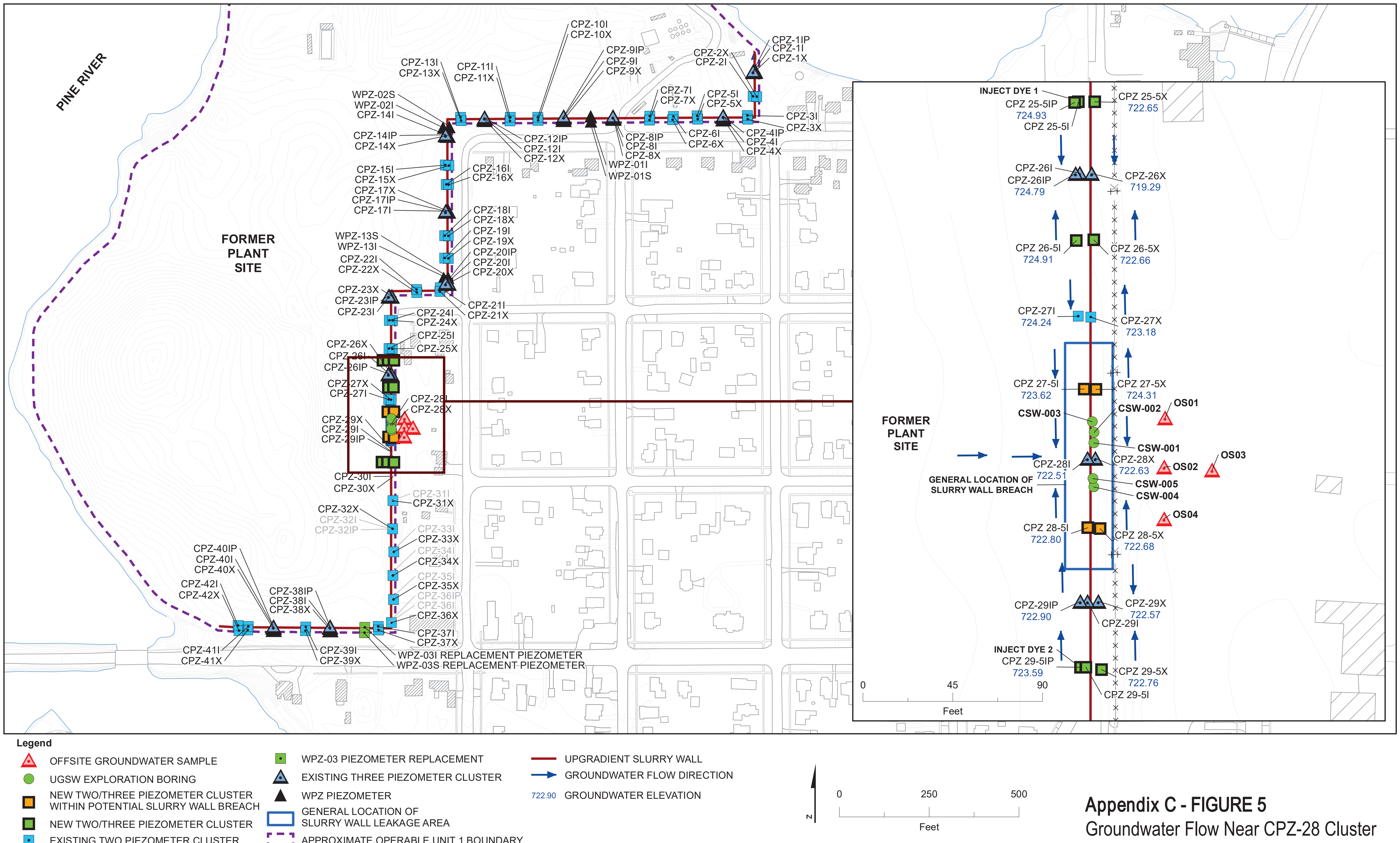






Appendix C - FIGURE 4
Upgradient Slurry Wall Piezometer Results -
2022 Groundwater Elevation Measurements
Velsicol Chemical Corporation Superfund Site
Saint Louis, Michigan

Notes:
1. Bar Graphs greater than Zero = Positive hydraulic gradients (away from site) and indicate upgradient slurry wall is effective.
2. Bar Graphs less than or close to Zero = Negative or negligible hydraulic gradients (inward/toward the site) indicate substandard upgradient slurry wall effectiveness.

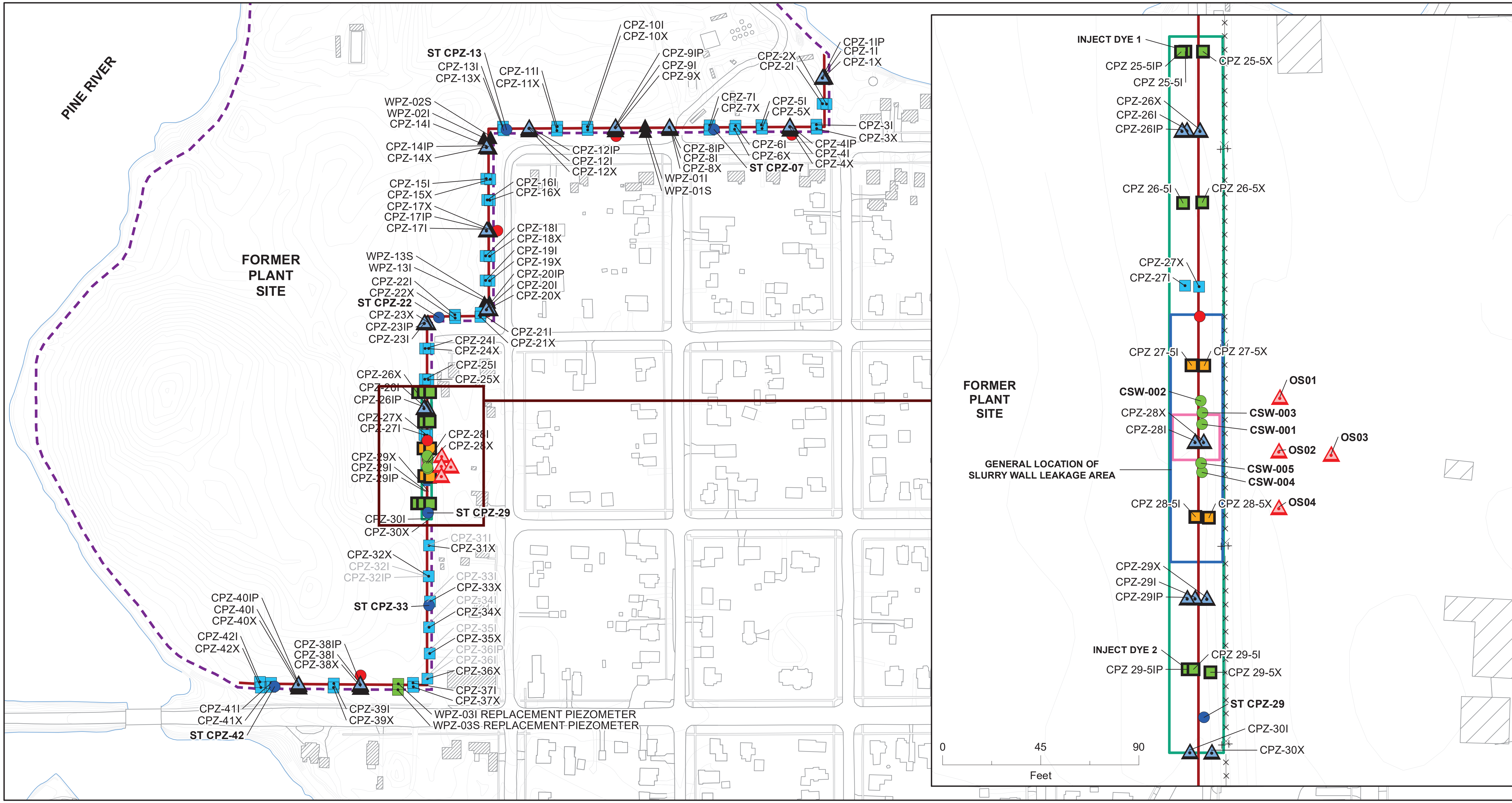


Appendix C - FIGURE 5

Groundwater Flow Near CPZ-28 Cluster

Velsicol Chemical Corporation Superfund Site

Saint Louis, Michigan



Legend

- OFFSITE GROUNDWATER SAMPLE
- UGSW EXPLORATION BORING
- NEW TWO/THREE PIEZOMETER CLUSTER WITHIN POTENTIAL SLURRY WALL BREACH
- NEW TWO/THREE PIEZOMETER CLUSTER
- EXISTING TWO PIEZOMETER CLUSTER
- WPZ-03 PIEZOMETER REPLACEMENT
- EXISTING THREE PIEZOMETER CLUSTER
- 2022 SHELBY TUBE SAMPLE
- 2019 SHELBY TUBE SAMPLE
- WPZ PIEZOMETER
- UPGRADIENT SLURRY WALL
- APPROXIMATE FENCE ALIGNMENT
- AREA OF DEGRADED UGSW PERFORMANCE
- SLURRY WALL BREACH IDENTIFIED BY SLURRY WALL BORINGS
- GENERAL LOCATION OF SLURRY WALL LEAKAGE AREA
- APPROXIMATE OPERABLE UNIT 1 BOUNDARY

N

0 250 500

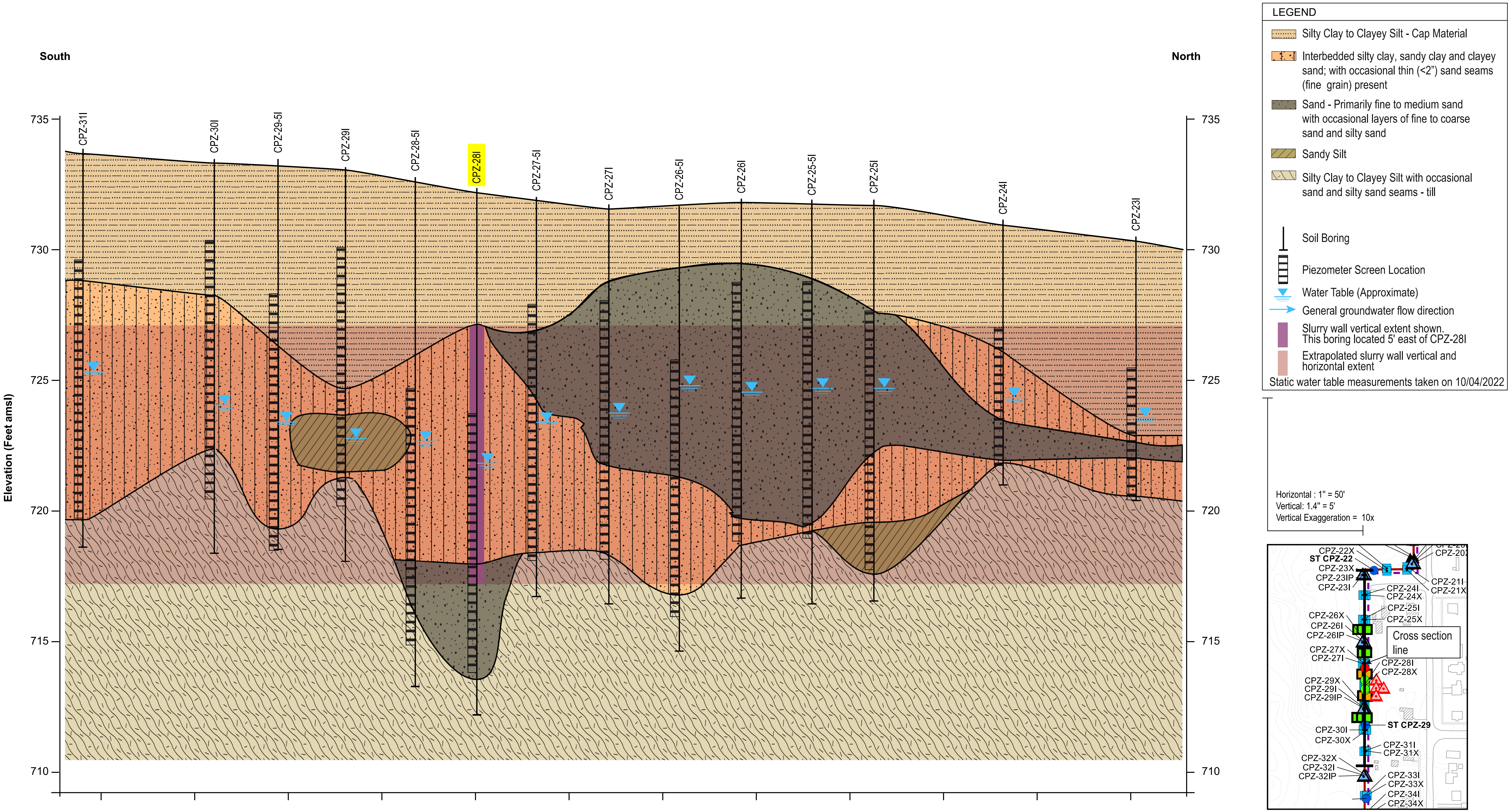
Feet

Appendix C - FIGURE 6

Location of Breach and Substandard Performance Area in Upgradient Slurry Wall

Velsicol Chemical Corporation Superfund Site

Saint Louis, Michigan

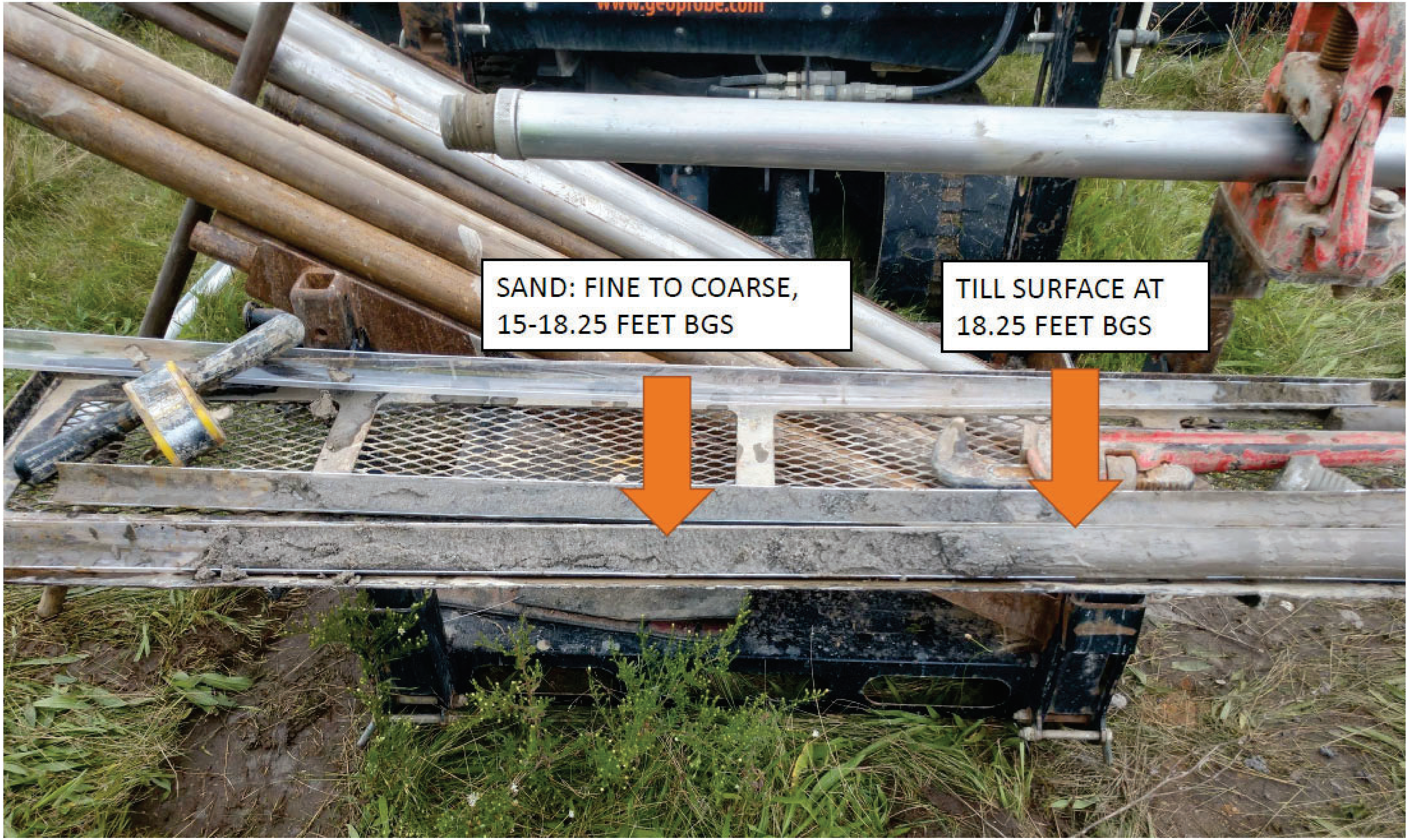


Note: Stratigraphy lines are based on interpretations between soil borings and represent approximate boundaries. Actual transitions between soil boring locations may vary from those presented in this cross section.

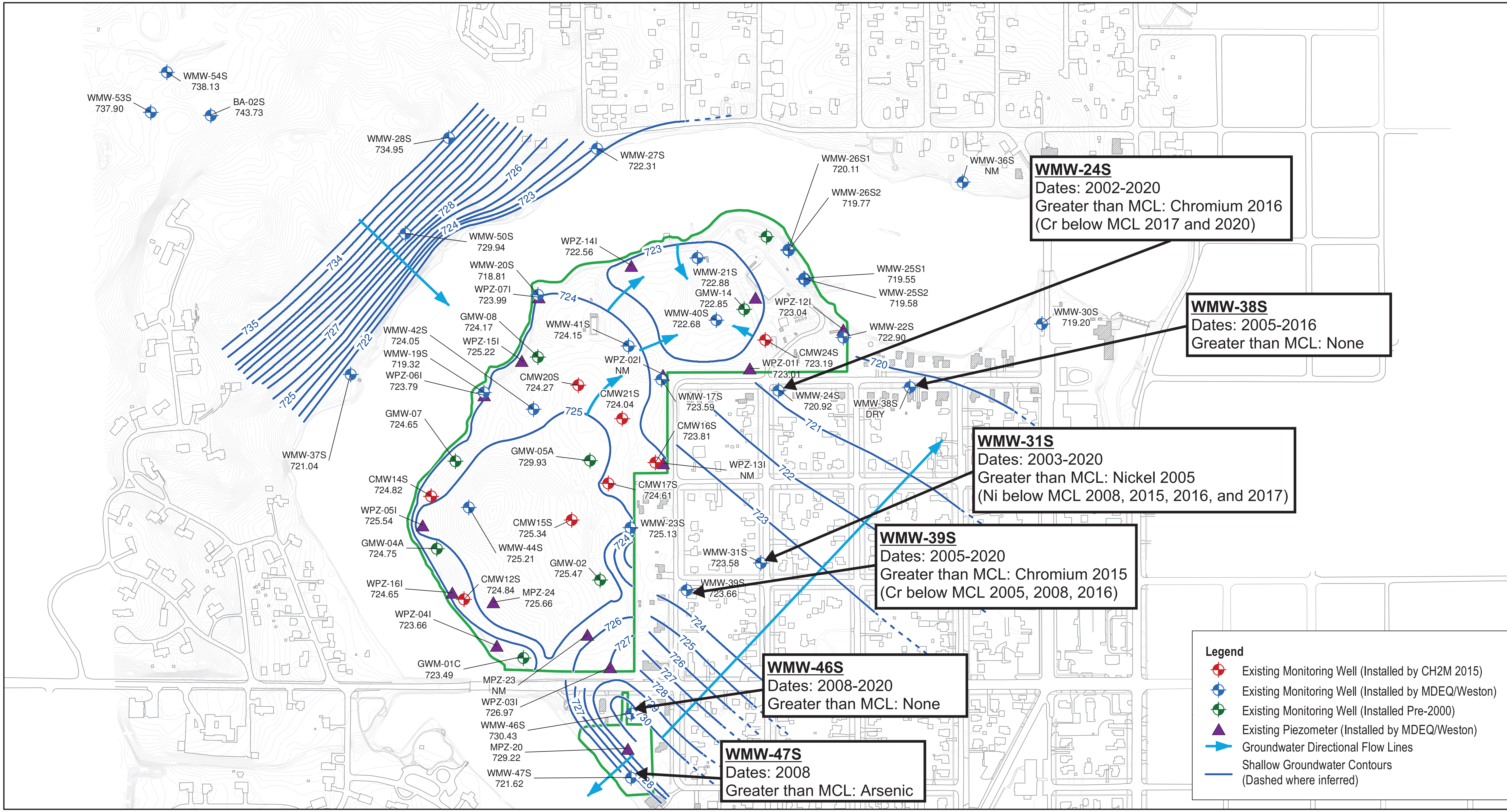
Appendix C - FIGURE 7

Upgradient Slurry Wall North-South Hydrogeologic Cross-Section

Velsicol Chemical Corporation Superfund Site
Saint Louis, Michigan



Appendix C - FIGURE 8
CPZ-28 Upgradient Slurry Wall Boring Sample
Velsicol Chemical Corporation Superfund Site
Saint Louis, Michigan



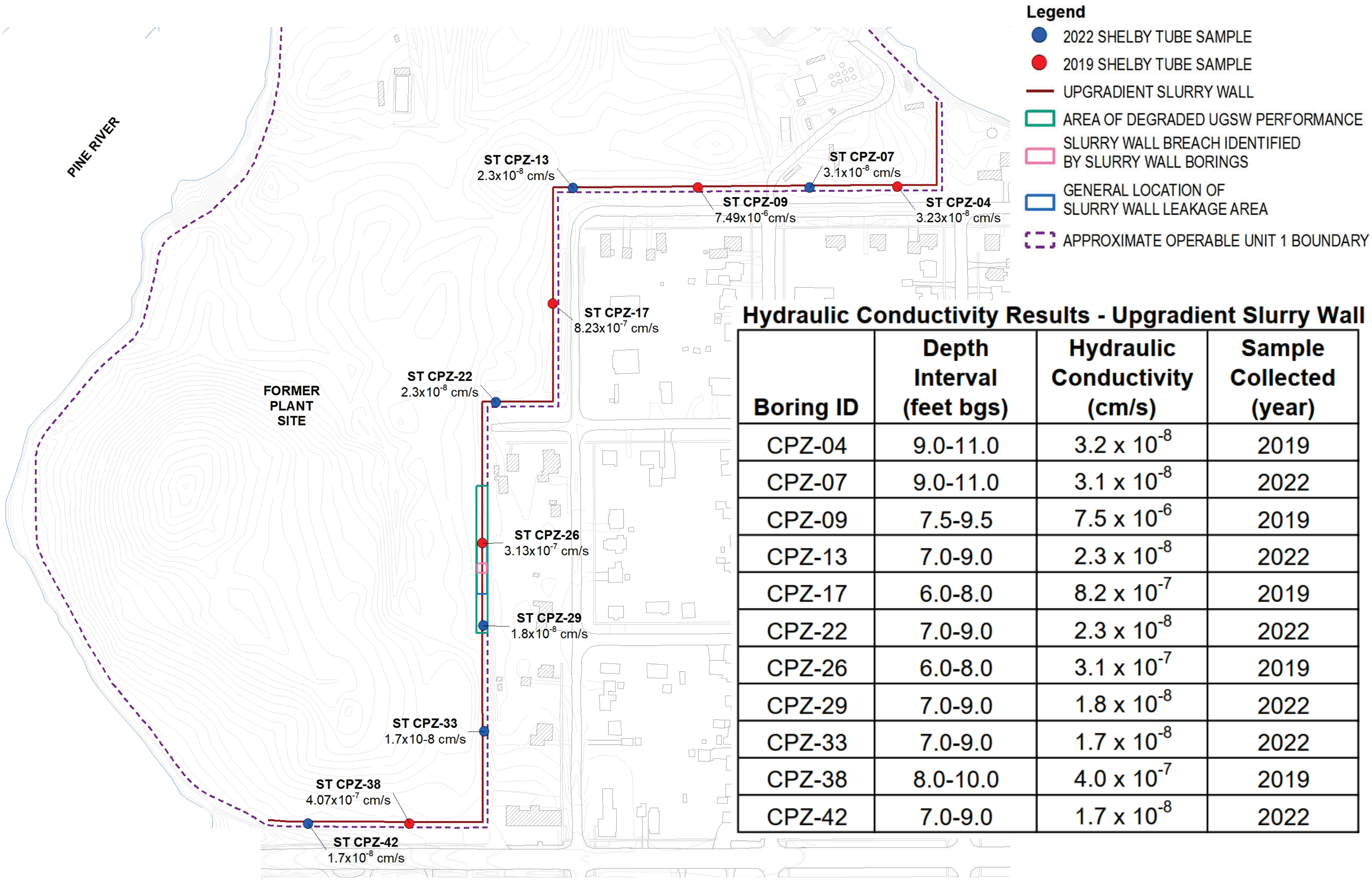
N

0 450 900 Feet

NOTES:

1. BASE MAP PROVIDED BY WESTON SOLUTIONS OF MICHIGAN, INC.
2. LAND SURVEY ELEVATIONS WERE REFERENCED TO NAVD OF 1988 FEET MSL. THE HORIZONTAL LOCATIONS WERE REFERENCED TO THE MICHIGAN STATE PLANE COORDINATE SYSTEM NAD83, INTERNATIONAL FEET - SOUTH (2113) ZONE.

Appendix C - FIGURE 9
OU1 Shallow Unit Groundwater Analytical Data from Adjacent or Nearby Properties
Velsicol Chemical Corporation Superfund Site
Saint Louis, Michigan



Hydraulic Conductivity Results - Upgradient Slurry Wall

Boring ID	Depth Interval (feet bgs)	Hydraulic Conductivity (cm/s)	Sample Collected (year)
CPZ-04	9.0-11.0	3.2×10^{-8}	2019
CPZ-07	9.0-11.0	3.1×10^{-8}	2022
CPZ-09	7.5-9.5	7.5×10^{-6}	2019
CPZ-13	7.0-9.0	2.3×10^{-8}	2022
CPZ-17	6.0-8.0	8.2×10^{-7}	2019
CPZ-22	7.0-9.0	2.3×10^{-8}	2022
CPZ-26	6.0-8.0	3.1×10^{-7}	2019
CPZ-29	7.0-9.0	1.8×10^{-8}	2022
CPZ-33	7.0-9.0	1.7×10^{-8}	2022
CPZ-38	8.0-10.0	4.0×10^{-7}	2019
CPZ-42	7.0-9.0	1.7×10^{-8}	2022

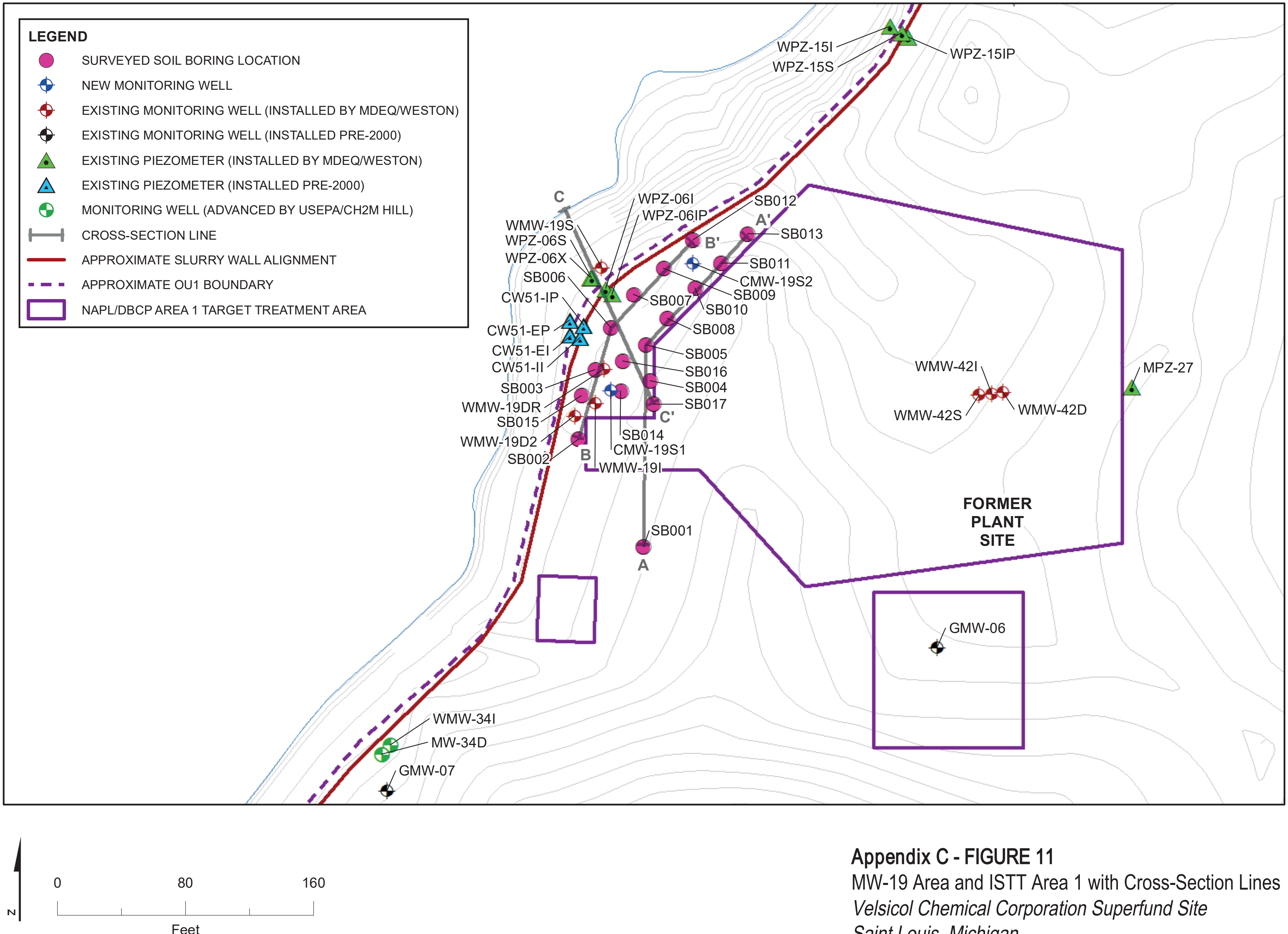
Notes:
1. Samples collected in 2019 and 2022.
2. 10 of 11 samples are 10^{-7} cm/s or lower (7 samples=10^{-8} cm/s, 3 samples=10^{-7} cm/s, 1 sample=10^{-6} cm/s).
3. Conductivity values are consistent with permeability standards established by the 1982 Consent Judgment for containment wall performance.

Appendix C - FIGURE 10

Upgradient Slurry Wall Hydraulic Conductivity Results

Velsicol Chemical Corporation Superfund Site

Saint Louis, Michigan

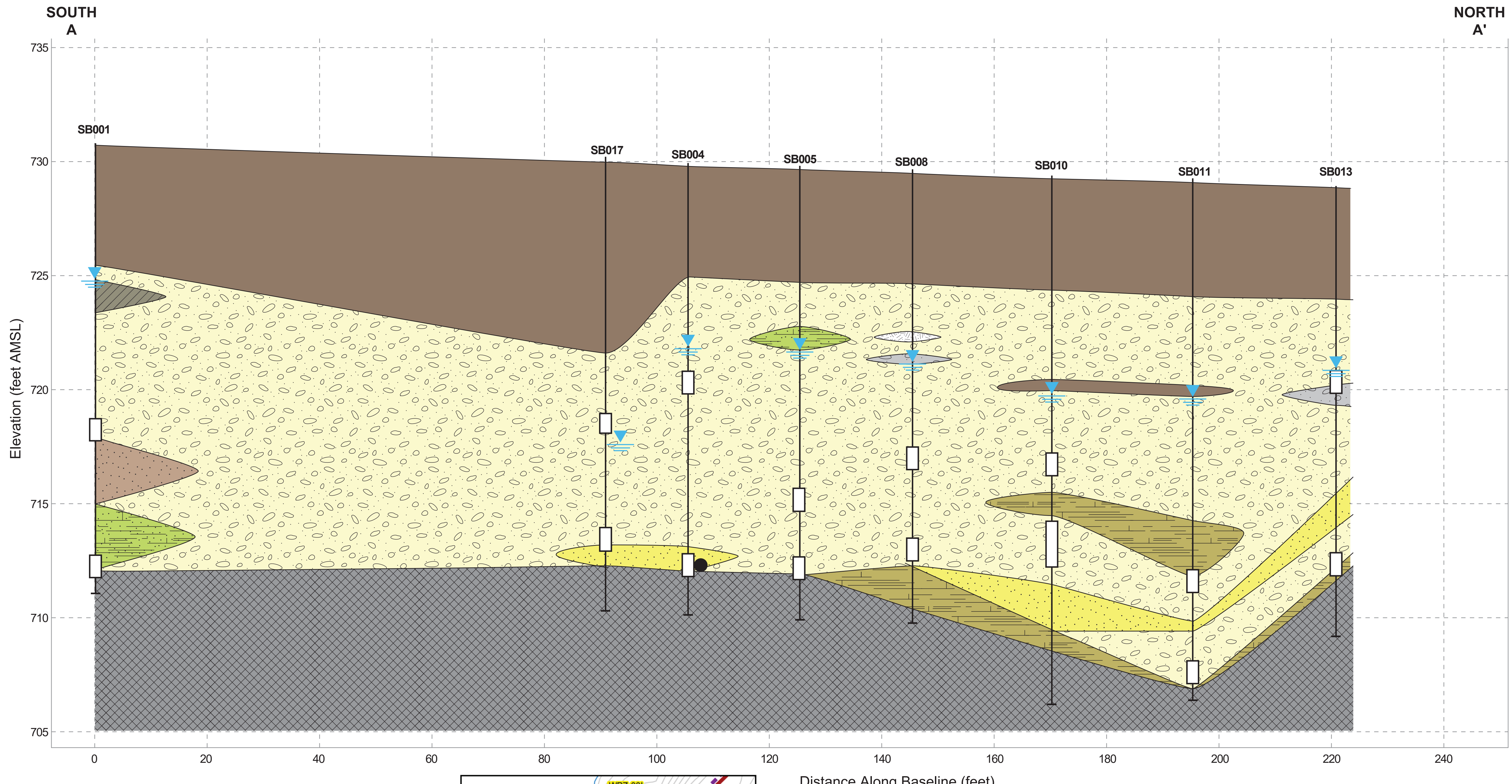


Appendix C - FIGURE 11

MW-19 Area and ISTT Area 1 with Cross-Section Lines

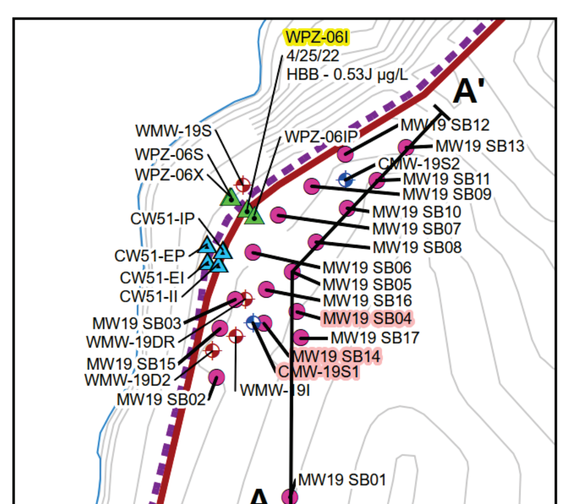
Velsicol Chemical Corporation Superfund Site

Saint Louis, Michigan

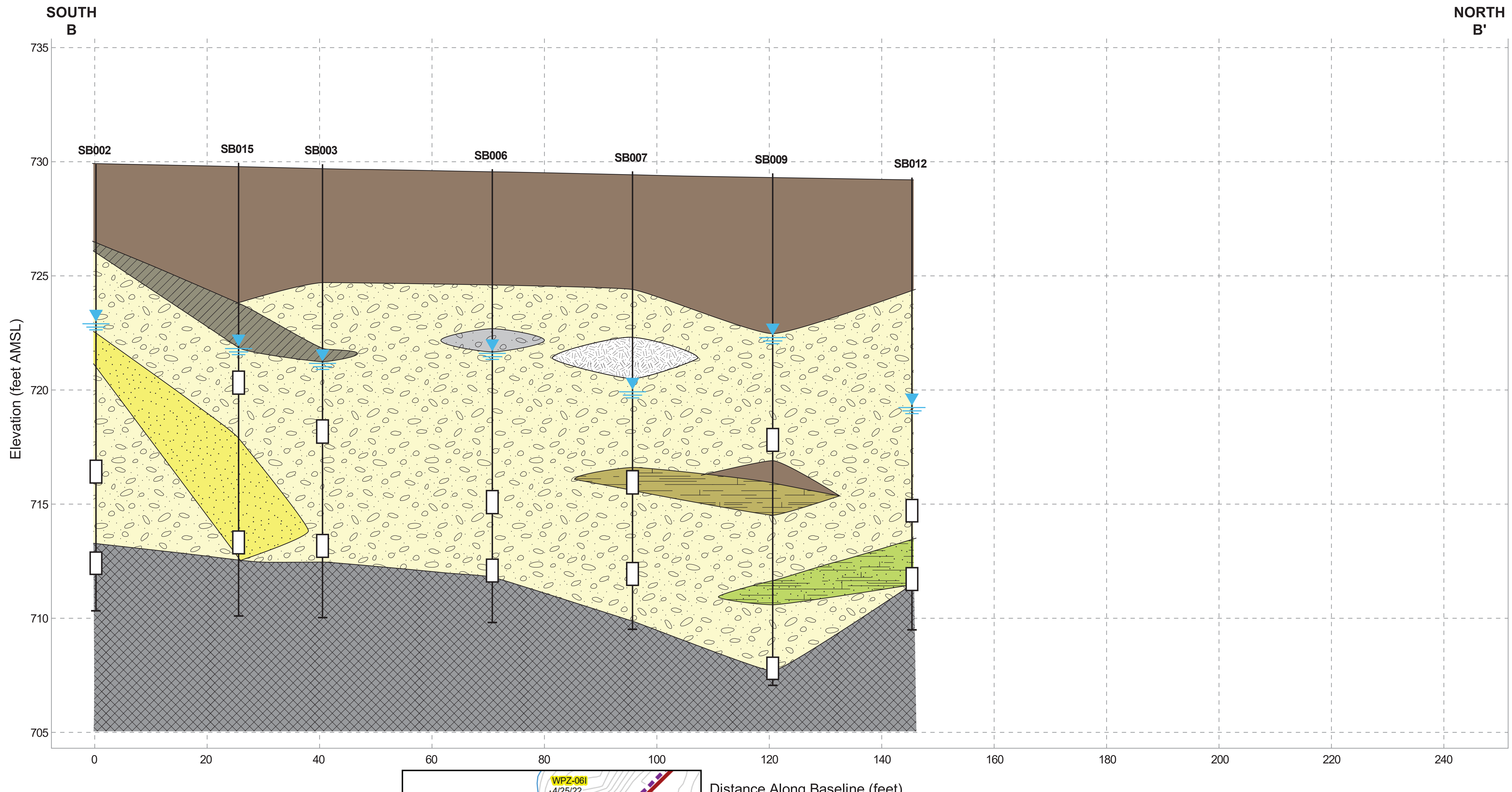


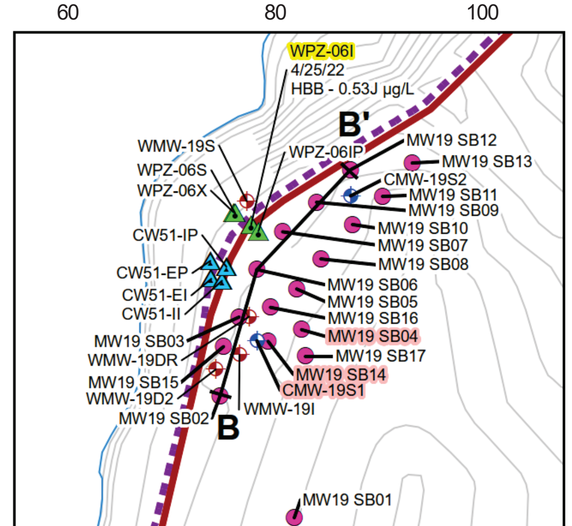
Legend
(Lithologic units dashed where inferred)

- Well Graded Sand
- Poorly Graded Sand
- Clay
- Lime Clay
- Sandy Clay
- Silt
- Silty Sand
- Till
- Gravel
- Non-native material, unknown composition
- Positive NAPL Test Kit Result
- Sample Interval
- Groundwater Level



Appendix C - FIGURE 12
Cross Section A–A'
Velsicol Chemical Corporation Superfund Site
Saint Louis, Michigan





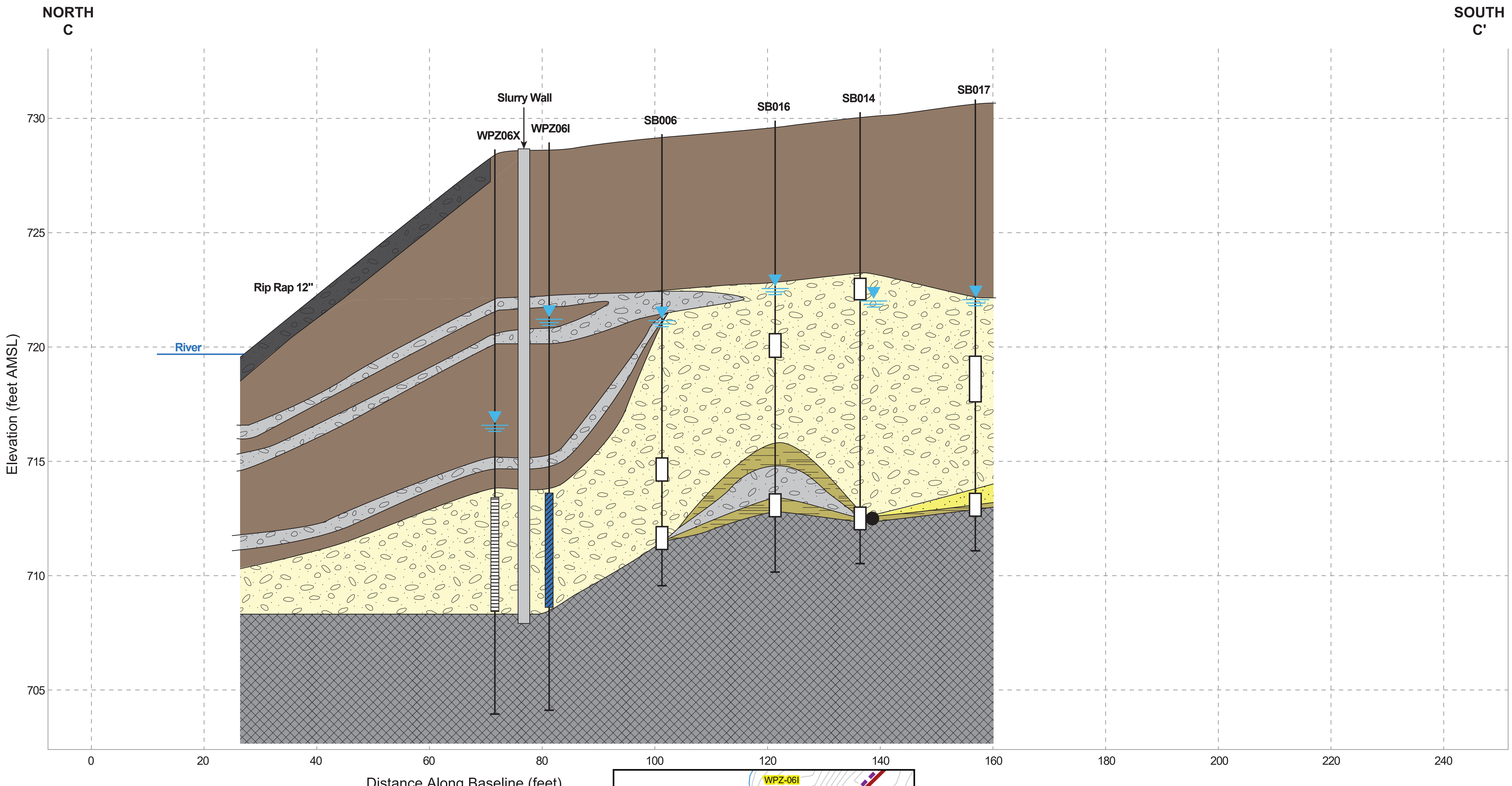
Legend
(Lithologic units dashed where inferred)

- Well Graded Sand
- Poorly Graded Sand
- Clay
- Lime Clay
- Sandy Clay
- Silt
- Silty Sand
- Till
- Gravel
- Non-native material, unknown composition
- Sample Interval
- Groundwater Level

Appendix C - FIGURE 13

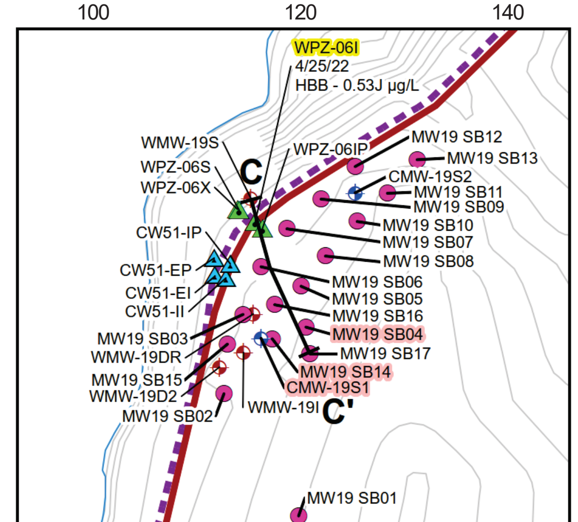
Cross Section B–B'

Velsicol Chemical Corporation Superfund Site
Saint Louis, Michigan



Legend
(Lithologic units dashed where inferred)

- Well Graded Sand
- Poorly Graded Sand
- Clay
- Lime Clay
- Sandy Clay
- Silt
- Silty Sand
- Till
- Gravel
- Positive NAPL Test Kit Result
- Sample Interval
- Groundwater Level
- Monitoring Well
- Groundwater Sample Location - Analytical Result > Water Solubility Criteria for one or more pesticides and/or SVOCs



Appendix C - FIGURE 14
Cross Section C–C'
Velsicol Chemical Corporation Superfund Site
Saint Louis, Michigan

Appendix D

Responsiveness Summary

Responsiveness summaries provide a comprehensive response to all major comments and concerns raised by the community. The responsiveness summary briefly summarizes major community concerns and documents the EPA's responses to the comments. Responsiveness summaries are intended to be concise and are most effective when all comments are clear and understandable to the reader. To make the responsiveness summary clear and understandable, the EPA typically organizes the main questions and concerns received from the public comment period and provides corresponding responses. Although a formal public comment period is required for the issuance of a Record of Decision, it is not required when issuing an Explanation of Significant Differences (ESD). In this case, a public meeting and a public comment period were held as the EPA has a long-standing relationship with the local community advisory group (CAG) and understands the importance of this Superfund Site and its cleanup to the community, which includes the CAG, the City of St. Louis, the Saginaw Chippewa Tribe, the State, and other stakeholders. The EPA saves all comments received during the public comment period as part of the Administrative Record.

As an act of good faith to commentors' concerns regarding inclusion of their letters in their entirety (and not summarized) and similar to the Responsiveness Summary published as part of the Velsicol Burn Pit Operable Unit 1 (OU1) Record of Decision, the EPA will include the six written comment letters received during the ESD Public Comment Period, and two oral comments stated at the July 31, 2024 Public Meeting, in full. These comment letters and verbal comments are included below with the EPA responses. The EPA responses are contained within or after each Comment Letter, as appropriate, and labelled "**EPA Response:**" and the EPA text is indented, italicized, and highlighted in gray. Please note, no letter transmittal pages are included in this Responsiveness Summary except for that included with Comment Letter #1.

Transmittal Letter for Comment Letter #1 –
Submitted by the Pine River Superfund Citizen Task Force, shown in full.

Attached are comments from the Community Advisory Group for the Velsicol Sites in St. Louis, Michigan. The comments offer questions and concerns about the EPA's intention to repair and re-use the Upgradient Slurry Wall that surrounds the 52-acre former chemical factory site, and EPA's decision to reverse its plan to capture leaking groundwater in a collection trench on the west side of the site.

EPA has filed an ESD to make these significant changes in the signed 2012 Record of Decision document.

As representatives of the wider community, the CAG has determined that more needs to be investigated before the adoption of the ESD plans for both the collection trench and the slurry wall. Community acceptance is not given to EPA at this time.
Sincerely,
Brittany Fremion, Chairperson

EPA Response: *The EPA is appreciative of the comments and questions submitted by the Pine River Superfund Citizen Task Force. The EPA has responded to these concerns in the forthcoming pages. Community acceptance is a modifying criterion that was evaluated in the 2012 Record of Decision for the OU1 remedy. Because the ESD is not a fundamental change to the overall cleanup approach, the nine criteria are not re-evaluated. The remedy still satisfies the statutory requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) that were detailed in the 2012 Record of Decision. The remedy and the changes detailed in this ESD are still protective of human health and the environment, are compliant with applicable or relevant and appropriate Requirements (ARARs), and do not change the remedial action objectives.*

The EPA would like to point out that the EPA has not "reversed its plan to capture leaking groundwater in a collection trench on the west side of the site". As described in the Record of Decision and the ESD, there will be design and implementation of a groundwater perimeter drain and groundwater treatment system, along with the continued operation of the current dense non aqueous phase liquid (DNAPL)/ groundwater collection system. To clarify, the ESD details, with multiple lines of evidence, removal of the expansion of the current DNAPL/ groundwater collection system into the Monitoring Well-19 (MW-19) Area, as the source material, DNAPL, in this area was addressed by in-situ thermal treatment.

The EPA understands that the Pine River Superfund Citizen Task Force is not aligned with the EPA's decision as detailed in the ESD. The EPA's decision is also supported by the Michigan Department of Environment, Great Lakes, and Energy (EGLE). Multiple lines of evidence are presented in this ESD, and new data were collected from multiple investigations over recent years and evaluated within the context of known Site information, and support the EPA's decision. The EPA will continue to work with the Pine River Superfund Citizen Task Force, listen to their concerns, discuss and debate various technical subjects, and incorporate their input into Site actions when appropriate.

<u>Comment Letter #1 –</u>
Submitted by the Pine River Superfund Citizen Task Force, shown in full.

Background
The Pine River Superfund Citizen Task Force is a community advisory group (CAG) that formed in 1997 in response to the US EPA Emergency Removal Action at the Velsicol Chemical Corp. Superfund Site. For more than 25 years the group has represented community concerns, shared critical information about the site's history, and worked tirelessly to clean up the Pine River watershed and protect human health.

The first site remedy executed in the 1982 Consent Judgment was flawed leading directly to the issues we face today. When Velsicol entered into the agreement, they paid $38.5 million to enact a remedy that failed. Since the beginning of the second cleanup (initiated in 1998), federal and state governments and US taxpayers have paid nearly $400 million to remediate the Velsicol Chemical Corp. Superfund Site. Our town, river, and future generations deserve the best possible remedy. The estimated $20 million saved by repairing a portion of the existing slurry wall represents a significant amount of money. But the cost savings, after such a tremendous investment of time and money, and at the sacrifice of environmental and human health, should not drive this decision.

Community concerns about the integrity of the slurry wall are well-founded. Beginning with the initial emergency removal of river sediment in OU2, it was clear that chemical compounds were leaking through the slurry wall towards the river. This prompted the construction of a "temporary" drain system collecting Dense Non-Aqueous Phase Liquid (DNAPL) that is still in operation. In 2004-2005, U.S. EPA discovered parachlorobenzene sulfonic acid (pCBSA) in municipal wells approximately 300 feet below grade indicating chemicals from the Velsicol plant site were migrating vertically through what was believed to be an "impermeable" till layer into the lower aquifer.

The Remedial Investigation (RI) in 2006 (and final FS/ROD in 2012), further demonstrated that chemicals had compromised the till layer and moved into and through the till into permeable sand seams. The RI found that chemicals in contact with the slurry wall compromised the integrity of the slurry wall material, allowing pathways into the river and in one instance through to the till near the Northeast shore of the Pine River at the St. Louis Dam (the current site of a senior living facility – MW 30). Further investigation found proper completion and installation of the slurry wall was lacking in some parts. Additionally, the "engineered" cap constructed on the top of the former plant site had serious and pervasive issues with permeability and leaking.

Comments: The following section includes concerns and questions that we have related to the ESD investigations and related documents.

1. UGSW failure is linked to a changed hydrodynamic situation due to cessation of municipal well pumping. Piezometers and dye tests show that in the upgradient area, there is one specific location in which there appears to be water inside the former plant site

leaking “eastward” towards ANP. *Can U.S. EPA give an estimate on when this breach provided a conduit for water to move away from the initial direction – toward the river? Has this been occurring for a long time?*

EPA Response: *The comment above assumes a causal link between the “failure” of a section of the upgradient slurry wall and the changed hydrodynamic conditions associated with the cessation of pumping from the City of St. Louis municipal water supply wells that occurred in October 2015 with the formation of the Gratiot Area Water Authority (GAWA). There is no causal link between these two occurrences.*

The shutdown of the St. Louis municipal water supply wells influenced local and regional groundwater flow conditions and this change is significant for groundwater flow in the lower units. Groundwater flow in the lower unit showed more uniform groundwater flow to the east, and an overall flattening of the flow gradients as the lower unit recovered in response to the cessation of pumping of the municipal water supply wells. The cessation of pumping also greatly reduced, and at some locations eliminated, the downward hydraulic gradient previously noted in the subsurface. Though this event is and was important, it has not significantly impacted groundwater flow in the shallow unit as demonstrated by the shallow unit groundwater flow condition shown on Figure 3 in Appendix C of the ESD. Figure 3 shows shallow unit groundwater flow conditions before and after the cessation of pumping from the municipal water supply wells. That figure shows the shallow unit groundwater condition for June 2015 (before) in comparison to the groundwater flow condition 1 year (October 2016) and 5 years (October 2020) after the cessation of pumping is essentially the same.

The portion of the upgradient slurry wall that is responsible for the substandard hydraulic performance and that will be repaired is caused by the fact that the bottom elevation of the slurry wall was not constructed at the proper elevation, and as a result, it is not keyed into the underlying till unit. This condition has been present since the upgradient slurry wall was constructed.

The EPA has discussed what shallow unit groundwater flow in the vicinity of the site would look like in a more “natural setting” with the Pine River Superfund Citizen Task Force. Prior to the construction of the slurry wall, shallow unit groundwater flowed through the former plant site and discharged into the Pine River. This condition is illustrated in ESD Appendix C Figure 1. The construction of the slurry wall caused a “diversion” of groundwater flow around the former plant site property prior to discharge into the Pine River. This condition is illustrated in ESD Appendix C Figure 2. Please note that this figure also illustrates the condition of the slurry wall, namely that it allows groundwater discharge through the downgradient portion (along river) of the slurry wall and also shows the flow through the upgradient slurry wall repair area.

2. It is interesting that despite the apparent breach and movement of groundwater, COCs are not found at high concentrations outside the plant site. From our perspective, this can only be explained by one or more of the following cases: (1) The chemical contamination in this part of the former plant site is minimal (less polluted) compared to what it is in other parts. (2) The migration of groundwater offsite is very recent. (3) The migration of groundwater offsite is ephemeral and not constant. *Is there another explanation that U.S. EPA or their consultants have to help us understand this?*

   EPA Response: *The Pine River Superfund Citizen Task Force comments states that "despite the apparent breach and movement of groundwater, COCs are not found at high concentrations outside the plant site". This is true and is described in the ESD as well as the Supplemental Upgradient Slurry Wall Investigation Technical Memorandum (CH2M 2023). In April 2022, the EPA's contractor, CH2M, collected groundwater samples from four offsite temporary wells and several onsite slurry wall piezometers to evaluate potential contaminant migration through the upgradient slurry wall leakage area. The groundwater samples were collected from CPZ-28I, CPZ-28X, and the four temporary well samples were collected from a residential yard located immediately east of piezometer CPZ-28. Additionally, in May 2022, groundwater samples were collected from 13 slurry wall piezometers in this area of the site.*

   The groundwater sample analytical data indicated benzene concentrations greater than the EPA maximum contaminant level (MCL) were present at CPZ-28I and CPZ-28X for the April 2022 sampling event. The May 2022 groundwater sample analytical results were similar and indicated that benzene exceeded the MCL at CPZ-28X, CPZ-28-5I, and CPZ-28-5X. There were no MCL exceedances noted in the groundwater samples collected from the four offsite temporary monitoring locations. These sample results were discussed in the ESD in the multiple lines of evidence section and the locations depicted in ESD Appendix C Figure 5.

   The Pine River Superfund Citizen Task Force comment also presents a community perspective regarding the groundwater concentrations immediately adjacent to the site. Each is discussed below.

   - *First, the Pine River Superfund Citizen Task Force asks if the "chemical contamination in this part of the former plant site is minimal (less polluted) compared to what it is in other parts". **Answer**: This area of the site is less contaminated than other areas of the site. In addition, a significant amount of the contamination was removed from this area of the site during the 2023 Potential Source Area 1 excavation.*
   - *The Pine River Superfund Citizen Task Force asks if "the migration of groundwater offsite is very recent". **Answer**: As described above, the construction of the slurry wall in the repair area was not keyed into the till unit and this shortcoming was present at the time of construction. Also constructed as part of the original containment system was a cap and a groundwater extraction system. The conditions that led to groundwater flowing from the former plant site thorough the upgradient slurry wall repair area into the neighborhood are tied to the*

performance of all three components. The slurry wall, particularly the upgradient portion of the slurry wall, can and does significantly impede groundwater flow. As the remedial investigation showed, although there is significant leakage through the downgradient portion (along river) of the slurry wall, its presence impedes groundwater flow. Also installed as part of the original remedy was a low permeability cap and a groundwater control tile. The low permeability cap was not of a sufficient quality to prevent water from infiltrating into the groundwater system and as described in the remedial investigation site history (Weston Solutions 2006), groundwater removal through the original groundwater control tile ended in the late 1990s. Collectively, these conditions resulted in an increase in the groundwater elevation inside the slurry wall. This condition is referred to as a groundwater mound. Given that the elevation of the groundwater inside the slurry wall was higher than the groundwater elevation on the outside of the upgradient slurry wall, the potential for groundwater leakage was created on the upgradient side (upland) of the site. This condition was created in the 1990s and still exists today.

- *Lastly, the Pine River Superfund Citizen Task Force asks if "the migration of groundwater offsite is ephemeral and not constant" as a means to explain why significant concentrations of COCs are not found in the adjacent and nearby properties (ANP).* ***Answer:*** *As stated above, this area is not as contaminated as other parts of the site. In addition, the amount of flow through the repair area introducing site groundwater to the ANP groundwater is not large enough to have a significant impact on the groundwater condition present in the ANP properties.*

3. The ESD summary of evidence stated in the groundwater analytical data that, "groundwater samples collected in the shallow unit in the adjacent or nearby properties indicate that contamination is not leaving the Site toward the residential properties adjacent to the Site." But in the next sentence it states that, "In addition, COC analytical results from groundwater samples collected adjacent to the upgradient slurry wall breach do not exceed the EPA maximum contaminant limits." *Which is it?*

   EPA Response: *As described above, analytical results from groundwater samples collected offsite adjacent to the upgradient slurry wall repair area do not exceed the EPA maximum contaminant levels. The maximum contaminant level, or MCL, is an enforceable standard by the EPA and is the maximum level allowed of a contaminant in water which is delivered to any user of a public water system. The results in the ESD show that groundwater contamination at concentrations greater than the maximum contaminant limit is not leaving the former plant site.*

4. Related to the ESD engineering evaluation for different potential methods of repair:
   - In the evidence summary for groundwater monitoring, the EPA states that "results indicated that repairing the breach or installing a vertical sheet pile wall would only change the combined flow rate from the remediation system by less than 1 gallon per minute." *Is that movement from the breach? Is that movement along the entire*

upgradient slurry wall?

EPA Response: *The Velsicol Groundwater Flow Model (VGFM) was created to serve as a mathematical representation of the groundwater flow system to provide the EPA with decision support related to groundwater flow beneath and adjacent to the site. The VGFM was originally created in 2010 and was updated in 2017 and 2023. The 2023 update was completed to project the volume of extracted groundwater from a future perimeter drain and extraction well system, based on the following three scenarios:*

1. *The upgradient slurry wall in its current condition.*
2. *Implementation of repair to the upgradient slurry wall leakage area.*
3. *Installation of a sheet pile vertical barrier wall on the upgradient side of the Site.*

The results of the 2023 VGFM update indicated that repairing the upgradient slurry wall leakage area reduced groundwater extraction rates by 0.1 gallons per minute relative to its current condition. Installation of a steel sheet pile wall over the entire upgradient side of the site reduced groundwater extraction rates by 0.9 gallons per minute relative to its current condition.

- This matters because the ESD noted that the hydraulic conductivity in the upgradient slurry wall ranged from 7.48×10^{-6} to 1×10^{-8}. These sound like very small numbers, but when comparing permeability of a contaminant moving through a slurry wall with these permeabilities, that could be a difference between 138 days and 285 years, as outlined in the following table:

Hydraulic Conductivity (Permeability)	Time to Move 3 Feet (90 cm)
1×10^{-8} cm/s	104,000 days (285 yrs)
1×10^{-7} cm/s	10,400 days (28.5 yrs)
7.48×10^{-6} cm/s	138 days (0.4 yrs)

EPA Response: *Hydraulic conductivity is a property of a porous material (e.g. soils and rocks) that describes the ease with which a fluid can move through the pore space. Hydraulic conductivity is controlled by the following properties of the material:*

- ***Permeability*** *– The permeability of porous materials is a property indicating the degree to which the pore spaces are connected.*
- ***Saturation*** *– For fluids to flow in porous material it must be saturated. Stated another way, all the pore spaces must be full of fluid before flow can occur.*
- ***Fluid Properties*** *– Flow through porous material is also dependent on the density and viscosity of the fluid. To illustrate this, think of water flowing through porous material versus molasses flowing through the same material.*

Although the units assigned to hydraulic conductivity are distance (cm)/time (sec), hydraulic conductivity is not the same as groundwater velocity, and therefore cannot be directly converted as such. Groundwater flow velocity can be calculated using a variant of Darcy's Law which uses hydraulic conductivity, hydraulic gradient, and effective porosity to estimate groundwater flow velocity.

- Lastly, bentonite, being a clay, expands when wet and may crack when dried out. Climate models for this region should be taken into consideration for any long-term remedy selection.

  EPA Response: *The EPA agrees, climate change is an important consideration. Bentonite is a layered silicate clay mineral that is used in many industries and, with respect to the environmental industry, it is used for engineered barriers including barriers of high-level waste repositories. Bentonite is selected because of its water absorption, expansion, plasticity, and adsorption properties across a large range of temperatures and moisture contents, which would encompass changes in regional temperatures or precipitation due to climate change. No significant changes of hydraulic and mechanical properties have been reported for bentonite materials exposed to temperatures of at least 120°C under wet conditions, which would be well outside potential temperature changes in the ground due to climate change. Because the slurry wall repair is being done at and below the groundwater table, which falls below the freezing zone, cold temperatures are not expected to affect the performance of the slurry wall repair.*

5. In the words of the U.S. EPA, "*All landfills and containment systems, especially complex ones will fail. It is just a matter of time.*" We demand vigilant monitoring as the slurry wall is repaired and continuing annually, in addition to 5-year assessments.

   - The most important thing, from our perspective, has to do with the development of a comprehensive, ongoing monitoring plan that recognizes that this is a "system" containing integrated parts that must work together. We feel there should be discussions starting now on how each part of the total containment system remedy will be working with other parts.

     EPA Response: *The EPA agrees that a comprehensive operations, maintenance, and monitoring plan is required for the Site's remedial systems. The Pine River Superfund Citizen Task Force is correct, that as the containment portions of the remedy are designed, time should be spent during the design process to consider operations, maintenance, and monitoring of those systems. This should include a full evaluation of occupational health and safety associated with the system construction, configuration, and operations, as well as description of required system inspections, security requirements and contingency planning for system operations, and a definition of monitoring and reporting requirements.*

   - Any responsible party for Operation and Maintenance (O & M) of the Velsicol Superfund Sites, be it the U.S. EPA, the State of Michigan, or local governmental bodies should create an annual report, easily accessible and in layperson verbiage regarding information related to any real or potential migration of contaminants into areas outside the containment system and the plan for addressing contaminant migration. In our opinion, this may be included as part of the hazard mitigation plan for the City of St. Louis and Gratiot County.

EPA Response: *There will be an annual reporting requirement included in a future system operation and maintenance plan.*

- EGLE has responsibility (as is the law) after a final remedy is in place. We want the state to commit to continuous and comprehensive monitoring of the upgradient slurry wall in the future and for that commitment to be backed up by a plan that ensures this work will be done. This is important as staff and regulatory agents change, along with funding and community resources.

  EPA Response: *The EPA acknowledges the Pine River Superfund Citizen Task Force comment on this topic.*

- The piezometers were excellent tools in identifying leaks. We want piezometers left in place and continually monitored as part of an annual or semi-annual evaluation of the containment system.

  EPA Response: *As part of the upgradient slurry wall repair, new piezometers will be installed, as detailed in the remedial design, to ensure it is functioning as intended. Furthermore, the operation and maintenance plan to be developed for the Site will include a permanent groundwater monitoring network with groundwater elevation monitoring to assess the performance of the entire OU1 remedy, including the upgradient slurry wall.*

- We also want monitoring around the ANP region with monitoring wells. There must be a plan for immediately addressing any breaches and investigating possible contamination in the ANP.

  EPA Response: *The operation and maintenance plan to be developed for the site will include groundwater monitoring in the ANP.*

6. We would like to see a comprehensive groundwater model done after water levels are adjusted and slurry wall remedy enacted. It is important to know what, if any impediments exist to groundwater flow inside the plant site proper given the vast amount of material that was left onsite.

   EPA Response: *The EPA has already developed a comprehensive groundwater model and will continue updating the Velsicol Groundwater Flow Model as new information is obtained to support Site decision making.*

7. The EPA's remedy criteria includes community approval. To achieve that goal, a written plan must be in place prior to finalizing the ESD. The plan needs to be well-funded to immediately repair any adverse occurrence if the slurry wall develops another breach, or any other part of the system does not function or needs repair or replacement. Also, if further issues are found while enacting a remedy, what is EPA's plan for handling the situation? In particular: (1) How will community members be notified as soon as any further compromises in the slurry wall are found? (2) What is the process if there needs to be updating to both the slurry wall issue and when new problems are encountered? And (3) what is the expected cost for EPA to remobilize and repair the UGSW in the future?

EPA Response: *As stated above, community acceptance is a modifying criterion that was evaluated in the 2011 Feasibility Study and the 2012 Record of Decision for the OU1 remedy. In addition, the remedy still satisfies statutory requirements that were detailed in the 2012 Record of Decision. The remedy and the changes detailed in the ESD are still protective of human health and the environment, are compliant with applicable or relevant and appropriate requirements (ARARs), and do not change the remedial action objectives.*

The EPA and its regulatory partner, EGLE, will develop a detailed operation and maintenance plan and share it with the public, as appropriate, at the completion of the implementation of the containment system remedy components. Please note the containment system remedy includes the downgradient vertical barrier wall installation, upgradient slurry wall repair, groundwater extraction and treatment system, groundwater perimeter drain, and the cap.

As the components of the containment remedy are designed, constructed, and tested, the EPA will continue to use our current communication pathways as outlined in the Community Involvement Plan, and provide the community with information. These include the following:

- *The EPA continues to evaluate site conditions, including groundwater analytical data and groundwater elevations, to meet the statutory requirement of the five-year review. The five-year review includes a full accounting and evaluation of the data, as well as the conclusions reached during data evaluation and this report is made available to the public.*
- *The Pine River Superfund Citizen Task Force holds monthly meetings. The EPA and EGLE attend the majority of these meetings in person, and occasionally virtually, to update the community on current and upcoming work, and also to provide technical briefings on current activities.*
- *The EPA publishes semi-annual or annual newsletters, periodic factsheets and post cards, which report Site milestones and are sent to the EPA's community mailing lists.*
- *The EPA developed a Velsicol listserv, which is an email distribution list that the EPA uses to send messages to all subscribers on the list.*
- *The Site has a dedicated Community Involvement Coordinator that facilitates communication, provides updates, and provides resources for various Site*

activities.

- *The EPA uses a contractor to facilitate communications regarding future reuse of the site and this communication has been occurring periodically for over twenty years. As design and construction of the site remedy continues, discussions regarding the potential future site reuse options will continue and include the Pine River Superfund Citizen Task Force, the State of Michigan Land Bank, the City of St. Louis, and potential other stakeholders into these important decisions.*
- *The EPA awarded a Technical Assistance Services for Communities (TASC) program grant to the Pine River Superfund Citizen Task Force, which provides third-party technical support to assist the task force with understanding site technical matters. The third-party support works at the direction of the Pine River Superfund Citizen Task Force.*
- *The EPA awarded several Technical Advisory Grants (TAG) to the Pine River Superfund Citizen Task Force over the years to support their effort in selecting and employing a technical advisor whose primary function is to review, summarize, and explain necessary technical aspects of the Site activities at the Pine River Superfund Citizen Task Force's request.*
- *The EPA continues to attend City Council meetings 1- 2 times a year, to provide a briefing of activities to the City and other community members.*

EPA and EGLE will provide oversight to a contractor selected to operate, monitor, and maintain the site containment remedy. Those activities will be governed by an operations and monitoring plan. If somethings happens that requires mobilization for extensive repairs those costs will be estimated by engineering professionals as needed.

8. It is a fact not disputed by EPA that the Downgradient Slurry Wall is full of holes and is leaking, with at least one hole at least seven feet wide. Another fact, undisputed by EPA, is that 5 inches of DNAPL has collected in a monitoring well that is located near the crumbling slurry wall. It is the *unproved theory* of EPA experts that the 5 inches remains steady in the hole because that area of the plant site is not leaking. Please, prove your theory before you jettison the plan to build a collection trench on that side of the plant site. If you pump out the DNAPL and the hole does not refill, you will have proven your theory as correct. If you pump out the DNAPL and the hole refills, your theory is incorrect. *Why risk being wrong about something this important?* Please do the work to test your theory.

EPA Response: *As described in the ESD, multiple lines of evidence were used to draw the conclusion to not expand the current DNAPL collection system into the MW-19 Area. These include DNAPL screening and soil sampling of 17 soil borings installed during the investigation of this area, groundwater sampling of monitoring wells in the vicinity, and DNAPL gauging of monitoring well CMW-19S1. These elements of the investigation were thoroughly discussed in the technical memorandum generated after completion of the 2022 field investigation and discussed in the ESD document. As stated in those documents, the DNAPL thickness* *was measured at 5-inches in July 2022, with additional measurements in August 2022 and January 2023 that indicated that the thickness of DNAPL was unchanged. The DNAPL thickness was measured again in August 2024 and again it was stable at 5-inches. In addition, there is a line of soil borings west (closer to the river) of CMW-19S1 that did not indicate any presence of DNAPL.*

Figure 4-2 included in the *__Feasibility Study Operable Unit One, Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan. November__* *(Weston 2011) shows the location of the proposed NAPL collection tile in this area of the site, and it is in the river (behind the downgradient vertical barrier wall). Sediment sampling completed in 2002 and 2010 did not show any DNAPL present in river sediments in this area of the site. As stated above, the MW-19 Area investigation has a line of DNAPL-free soil borings present between the residual DNAPL located in CMW-19S1 and the position of the DNAPL collection trench proposed in the feasibility study and ROD. Also shown on Figure 4-2 of the Feasibility Study is the perimeter drain. The perimeter drain, once installed, will run through the MW-19 Area and can easily be designed to collect residual DNAPL, if any, that is present in the subsurface.*

Conclusions

Based upon this history as well as decades of funding, time and effort invested in a second cleanup, from a community perspective, we want the best possible cleanup for our town and river, for current and future generations. The CAG perspective has remained consistent since the completion of the 2006 RI and 2012 ROD.

- Of paramount importance is:
  - Protection of Pine River water quality, especially after a $100 million remedy was enacted over 8 years;
  - Maintaining protection of human health for residents on the East side of the plant site: the ANP;
  - General protection and maintenance of human health and the environment not only now, but into the future.
  - There should be implementation of a sustainable remedy (not merely a “patch”).
  - There should be a plan that includes specific steps if/when the proposed remedy fails.
  - There should be consistent, comprehensive monitoring of the conditions around the plant site *outside* the slurry wall.

__EPA Response__: *The EPA agrees with the Pine River Superfund Citizen Task Force that maintaining the protection of the Pine River and human health are the most important concerns and EPA believes that the remedy modifications presented in the ESD do not compromise those goals.*

Comment Letter #2 –
Written by Jane Jelenek and shown in full

Upgradient Slurry Wall:
I wonder if a Responsible Party was present at the Velsicol Superfund Site in our town if things would have been decided differently. If Velsicol was still here, and had been required by EPA to do a more complete remediation than the failed remedy of the 1980s, would EPA allow them to cite significant differences and approve re-using the old slurry wall? More likely, EPA would tell Velsicol, yes, it will cost you an extra $20 million, but to do it right, you need to install an interlocking metal wall around the entire site.

> ***EPA Response:*** *Section 121 of the CERCLA established five principal requirements for the selection of remedies (pre-Record of Decision). Remedies must: 1) protect human health and the environment; 2) comply with ARARs unless a waiver is justified 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable; and 5) satisfy a preference for treatment as a principal element or provide an explanation in the Record of Decision as to why this preference was not met. The EPA developed nine criteria for evaluating remedies to ensure that all important considerations are factored into remedy selection decisions. Regardless of whether the site is PRP-led or EPA-led, the selected remedy must undergo the same evaluation process that utilizes the nine-criteria analysis to ensure the principal requirements of a remedy under Section 121 of CERCLA are met. For both PRP and EPA-led sites, the selected remedy is contingent upon the EPA's review and approval. This is what resulted in the Velsicol OU1 Record of Decision that was signed in 2012.*
>
> *For the commenter's hypothetical scenario, if a PRP proposed the remedy changes outlined in this ESD and cited the same lines of evidence, the EPA would still consider this a significant change and not a fundamental change. Therefore, EPA would continue to follow the selected remedy, remedial action objectives, and ARARs as put forth in the 2012 OU1 Record of Decision and support the use of an ESD to describe the significant differences between the remedy components as presented in the Record of Decision and the actions now proposed.*

That is what the Pine River Superfund Task Force is telling EPA now. Because the Velsicol sites have no responsible party, EPA has stepped up to take on the responsibility. And the Task Force is telling EPA that yes, it will cost EPA (us taxpayers) an extra $20 million, but we want you to use the most up-to-date technology to successfully complete this second remediation. We do not don't want a third remediation to be necessary because the money wasn't spent to give this beleaguered community the best that money could buy this time around.

In the reports, numbers were used to gauge the impermeability of the slurry wall and a metal wall. The numbers showed that the slurry wall is *almost as good* as a metal wall. Almost as good is not the best. Please, give us the best impermeability money can buy.

> **EPA Response**: *The hydraulic conductivity of the materials under consideration was not the sole line of evidence used to make the assessment presented in the ESD. Please see the response offered above to Comment Letter #1 by the Pine River*

Superfund Citizen Task Force letter at comment bullets 1, 2, and 4.

MW19:

It is a fact that the Downgradient Slurry Wall is full of holes and is leaking, with at least one hole at least seven feet wide. It is a fact that 5 inches of DNAPL has collected in a monitoring well that is located near the crumbling slurry wall. It is the unproved theory of EPA experts that the 5 inches remains steady in the hole because that area of the plant site is not leaking.

Please, prove your theory before you jettison the plan to build a collection trench on that side of the plant site. If you pump out the DNAPL and the hole does not refill, you will have proven your theory as correct. If you pump out the DNAPL and the hole refills, your theory is incorrect.

Why risk being wrong about something this important? Please do the work to test your theory.

EPA Response: *Please see the response offered above to Comment Letter #1 by the Pine River Superfund Citizen Task Force letter at comment bullet 8.*

Comment Letter #3 –
Written by Edward Lorenz and shown in full

I want to submit the following comment in response to the revisions to the clean-up plan for the Velsicol Chemical Superfund Site in St. Louis, Michigan.

I know I come to most of the interchanges with EPA plans from an odd perspective – both more concerned with human health impacts of decisions than most commentators and also taking a longer-term perspective probably linked to my professional life as a historian. But having received today an emotional call from a man who believes his sterility may be linked to PBB from Velsicol, I felt I had to write this comment.

First, all considerations of next steps at the Velsicol sites along the Pine River must be guided by the sites' exceptional histories. While other sites nationally have gotten to be better known to the general public, such as Love Canal, we are a site that led to the firing of an EPA Administrator. Furthermore, the Velsicol sites are directly tied to widespread human health impacts of our contamination directly entering the food chain of at least eight million people. Consequently, any discussion of containing contaminants with a geographically specific set of operable units borders upon the absurd. If our operable units include the downriver flood plain, what about a stored Gerber food jar with PBB from Velsicol.

I won't go further with that line of questioning, but I do want to pursue the history of our sites to address the responsibilities of current EPA staff. This is not a line of argument leading to criticism of staff but rather praise and support. From 1979 until November 1982 when the draft settlement between EPA and Velsicol was announced, EPA professional staff, to their great credit and too often ignored in thinking about problems at our sites, objected to Velsicol's "deal" with the government. These objections were not over a few details, rather they specifically objected to Velsicol's unworkable plan for containing known contaminants between a river and homes in the community. They argued this so vociferously that partisan leaders at the top of EPA and Superfund tried to get the critics fired, eventually leading to the jailing of the head of Superfund and the firing of EPA Administrator Anne Gorsuch.

I recount this because it is vitally important for current staff to realize that they have been left a nearly unresolvable dilemma. It in no way is their fault that they are asked to develop responses to a no-win containment plan. There is only so much money, even with restored Superfund taxes (their abolition in 1995 is another foolish, partisan policy decision impacting our sites). Worst, in town I only hear criticism of EPA for delay, when the delay and errors in past remediation are 100% the result of Velsicol's cheap effort to escape Michigan after they contaminated the state's food chain.

Second, the focus on correcting Velsicol's unworkable cheap remediation has distracted us repeatedly since 1983 from the real primary concern – responding to the human health consequences of the exposures – especially through the food chain – of exposures that we know took place. As was done in Libby, Montana, we need an effective clinical response to

the consequences of human exposures to the contaminants Velsicol released and which many humans ate or inhaled – not just PBB but also contaminants such as DBCP.
I don’t want to criticize friends who are making specific demands related to the slurry wall or its alternatives. Please consider their concerns and try to meet their expectations. But, please let us move out of the trees so we can see the forest of millions exposed to Velsicol’s contaminants. And, please help us move beyond the seemingly endless cycle of studies of the human health impacts of exposures and get to responding to human health needs related to exposures.

Thank you for your efforts to make the fatally flawed Velsicol settlement work. But please use your position at EPA to urge, even compel, federal and state human health agencies to respond to the needs of the people Velsicol exposed.

EPA Response: *EPA applauds the efforts of the Pine River Superfund Citizen Task Force efforts to bring attention to the PBB crisis and its work with Emory University to quantify the ongoing health effects of the disaster.*

Comment Letter #4 –

Written by Brittany Fremion, Ph.D., Chairperson, Pine River Superfund Citizen Task Force, Professor of History, Central Michigan University and shown in full

Velsicol closed its St. Louis plant in 1978 following the PBB disaster. In 1982, the firm entered into a consent decree with the state and federal government, and paid a total of $38.5 million for the cleanup and maintenance of its former plant site. The consent decree did not define the sum as a fine, thereby making the $38.5 million tax-deductible and, most importantly, freed Velsicol of future liability. Velsicol, under direction of federal and state agencies, razed its St. Louis facilities, capped the former plant site, and installed a slurry wall and collection trench around the perimeter to contain the contamination. The former plant site became one of the first Superfund Sites in the country and test for the then-new federal program established by the Comprehensive Environmental Response, Compensation and Liability Act. It remains a "monster site" and cautionary tale.

The St. Louis community had little input in the process, demonstrating the significant gap between residents and decision-makers. Evidence of the first cleanup's failure became clear within two decades and, in 1997, a US EPA Emergency Removal Action led concerned residents of the community and Pine River watershed to form the Pine River Superfund Citizen Task Force, a community advisory group (CAG). Named intentionally after the river instead of polluter to "reflect community concerns with the wider watershed, other sources of pollution, and threats to human health," the the Task Force has spearheaded efforts to clean up the town and river for more than twenty-five years.

I joined the CAG in 2018 and have witnessed the tenacity and dedication of its members, the significance of community knowledge in informing work on site, and the trepidation with which they have and continue to approach remedial investigations and actions. Our concerns are notable, as they are informed by past experiences. We are driven by the desire to do better for future generations.

From my perspective, in order to do better here and now, we need:

- Comprehensive, long-term monitoring of *OU2 and the ANP* including the use of piezometers and monitoring wells both within and outside the containment system so that breaches are identified as quickly as possible;
- *Annual* updates and reporting to community members and agency partners in addition to 5- year reviews;
- The development of a comprehensive and aggressive *response plan* that (1) explains how each part of the containment system works, (2) outlines the notification process for system changes or shifts in system dynamics, and (3) a identifies agency mobilization and funding sources.

Velsicol Chemical Corporation left behind a heavily contaminated community. We approach half a billion dollars to remediate Velsicol's legacy—nearly $400 million in funding provided largely by the federal government and US taxpayers. Because we no longer have a responsible party, we depend upon our agency partners at federal and state levels to be the best stewards possible.

St. Louis residents have endured and fought to protect their town and watershed through a second major cleanup. We do not want a third. We want the best cleanup possible now, which requires ongoing monitoring and planning for the future.

EPA Response: *Please see the responses offered above to Comment Letter #1 by the Pine River Superfund Citizen Task Force at comment bullets 5, 6, and 7.*

Comment #5 –
Written by Gary Smith and shown in full

Upgradient Slurry Wall Hydraulic Conductivity Results, Appendix C-Figure 10. You show 11 samples collected. Five in 2019 and six in 2020. The Upgradient Slurry Wall is 3,100 feet long. That would mean the average distance between samples is 281 feet. All but one met or exceeded the recommended hydraulic conductivity requirement of 10^-7 cm/s. The one that didn't came in at 7.5 x 10^-6 cm/s. Very small numbers but a very big difference. 10^-7 cm/s should take about 28.5 years to get through a properly built 3 foot bentonite slurry wall. 10^-6 cm/s, 138 days. Knowing that we have some very poorly constructed slurry walls surrounding the site and that NAPL and other contaminants can destroy a bentonite slurry wall are present and guilty, it would seem not enough samples were taken. What does EPA think I an appropriate spacing for detecting leaks and verifying the hydraulic conductivity of a slurry wall? Please support your response with field-based evidence or research.

Drilling a hole 2 feet into the slurry wall from the top of the wall and taking a sample from the middle of the wall doesn't seem like much of a representative sample for determining the hydraulic conductivity of 281 feet of wall. Especially when the wall is supposedly keyed into the till upwards of 20 foot into the ground.

> **EPA Response**: *In addition to the field samples collected to determine hydraulic conductivity, the EPA installed 47 piezometer pairs along the upgradient slurry wall during the evaluation of the upgradient slurry wall. DNAPL was not encountered during installation of the piezometers nor observed during water level measurements in any of the piezometers used to evaluate the upgradient slurry wall.*

You have stated there wasn't a plume leaving the Former Plant Site in the direction of the Adjacent Neighborhood Properties. Would you please provide in your response the document(s) that supports your statement? If you give me the document numbers I can look them up on the website. Preferably reports and mapage. Data such as numbers indicating the levels of contaminants found on the exterior of the Upgradient Slurry Wall also.

One document states "groundwater samples collected in the shallow unit in the adjacent or nearby properties indicate that contamination is not leaving the Site toward the residential properties." Then some sentences later it states that "In addition, COC analytical results from groundwater samples collected adjacent to the upgradient slurry wall breach do not exceed the EPA maximum contaminant limits." These statements are conflicting. If there are contaminants outside of the Site slurry walls that don't exceed the MCLs where did they come from? WMW-39S is a well across Watson St to the East of where the breach is and that has Chromium in it. How would that have gotten there?

> **EPA Response:** *To be clear, the EPA understands that the presence of the former chemical manufacturing facility had an impact on the surrounding area. What the EPA is saying is that there is a significant amount of data collected during the*

*remedial investigation completed by the state of Michigan and the remedial design investigations and supplemental groundwater characterization work completed by the EPA that indicate that there **are not** sustained groundwater contaminations exceeding the EPA maximum contaminant levels present in the ANP. References for that work are included below:*

- *Remedial Investigation Report for Operable Unit One, Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan (Weston 2006).*
- *Remedial Investigation Addendum Report for Operable Unit One, Velsicol Chemical Corporation Superfund Site, St. Louis, Gratiot County, Michigan (Weston 2009).*
- *Remedial Design Investigation Report - Velsicol Chemical Corporation Superfund Site, Former Plant Site Remedial Design Groundwater Characterization, St. Louis, Michigan (CH2M 2017).*
- *Technical Memorandum - Supplemental Groundwater Characterization Velsicol Chemical Corporation Superfund Site St. Louis, Michigan (CH2M 2020).*
- *Technical Memorandum - Supplemental Groundwater Characterization Velsicol Chemical Corporation Superfund Site St. Louis, Michigan (CH2M 2021).*

The patch you are proposing to make to the 350 foot bentonite slurry wall where the 20 foot breach is could very well jeopardize the entire remedial action. Our community is very much appreciative of the efforts and actions EPA has and is making to correct and cleanup the contamination allowed to be left behind by Velsicol Chemical. Having said that, we would prefer it if you never had to come back and do anymore correcting. When I get a nail in one of my tires I get it taken out and patched at the tire store. They tell me they use the best materials and have the best tire repairers in the business. Should last me the lifetime of the tire. Well…from experience I can say that isn't always the case. They're right about 45% of the time. This soil mixing has a certain amount of potential to fail. The soils compressibility is increased and hydraulic conductivity is reduced during the process. Due to the high degree of disruption of in-situ soil density plus the addition of the bentonite slurry, soil swell volumes must be considered. That potential to swell is real due to in-situ soil properties and bentonite addition percentages. We already know that the materials used in the current slurry wall have varied and since every foot of slurry wall hasn't been sampled where the patch is going the process is likely to be even more difficult to determine the right recipe everywhere. Kind of akin to putting a slurry wall along the down gradiant side where there is interference with water from the river. That didn't work out so well.

EPA Response: *The remedial design for the upgradient slurry wall repair assumes soil mixing completed using drilling-based soil mixing technology. This is typically completed by digging a shallow trench to guide alignment followed by drilling overlapping boreholes into the subsurface to a predetermined depth while simultaneously adding a bentonite slurry to achieve the desired wall properties.*

Once the EPA selects a contractor for this work, additional geotechnical testing of the subsurface will be completed to determine the exact method of installation and bentonite recipe. The contractor implementing the upgradient slurry wall repair will be required to develop a rigorous quality assurance plan that they will be required to follow under fulltime oversight provided by the U.S. Army Corps of Engineers.

A steel sheet pile wall is a piece of infrastructure like a road, bridge, or building. As a mechanical object, it has a lifespan. At its most basic, it is a piece of steel installed into a groundwater environment. It will corrode and it will eventually have to be repaired or sections replaced. The steel sheet pile wall designed for the down gradient vertical barrier has an expected lifespan of 50-75 years and, at some point, segments of that wall will have to be repaired or replaced. The repair of the upgradient slurry wall will achieve the Site's remedial action objectives, and the slurry recipe selected such that the lifespan of the wall exceeds that of a steel sheet pile wall. Given the longer lifespan of a slurry wall, its short- and long-term effectiveness, the ease with which it can be implemented (and future repair if needed), the cost savings, and the ability to still meet the Record of Decision requirements (containment, ARARs, RAOs, etc.), the upgradient slurry wall repair is an appropriate approach for containment on the upgradient side of the Site.

For these reasons and many others I simply can not agree with the proposal to patch and reuse the existing slurry wall. Putting a new wall in such as the sheet piling that is planned for the down gradiant vertical barrier wall will provide a more assurable barrier against leaking in or out of the Site and will work in concert with the other remedies being proposed like the perimeter drain system (that hasn't been designed yet), down gradiant vertical barrier wall, new clay cap and water treatment facility. Since, as you have stated, only one gallon of contaminated water being removed is the difference between the slurry wall and the sheet pile wall there is minimal effect. I understand the cost between the patch and reuse of the existing slurry wall is $20,000,000 less than putting in the sheet pie wall. The expense of coming back in the near future to address a wall failure would likely cost a lot more in the long run. Placing that burden on the State to take responsibility for correcting what should not have been done in the first place just to save some money now is unfair and unjust.

I expect this entire comment be attached to the ESD and Administrative Record along with any responses from EPA. Do not censor me.

Gary J Smith
St. Louis, Michigan

Comment Letter #6 – Gary Smith

MW-19 Technical Memorandum (980340) states 7 monitoring well samples for GW elevation and analytical were collected in the MW-19 Area April and July 2022. Per your field observations it was determined widespread NAPL was absent. Visible NAPL was found and verified by NTK results in 2 soil borings (SB004 and SB014) so a new monitoring well was installed (CMW-19S1) after the April event. Following that installation the new well measured 5 inches of DNAPL during the July 2022 GW sampling event. Was there any NAPL in WMW-19D2, WMW-19DR, WMW-19S, WMW-42S, I or D. No data was given.

> **EPA Response:** *DNAPL was not found in the wells listed above (WMW-19D2, WMW-19DR, WMW-19S, WMW-42S, I or D).*

Measurements were taken again in August 2022 and January 2023. The results indicated nothing had changed. It was still 5 inches. You determined DNAPL was stable and LIKELY the result of local residual DNAPL on the till.

Your use of the word "Likely" isn't very convincing science. You didn't rule out the possibility that DNAPL continues to migrate from the FPS and into the river. It is also likely this loss is being replaced at approximately the same rate which would keep the thickness the same or similar as prior samplings making it appear to be stable. Since we know there are numerous sand seams in and around this area it is just as likely finding its way into the river as your interpretation of the data suggesting it isn't. You have stated many times that you aren't going to chase sand seams. Lacking confirmation that supports your conclusion and ruling out another scenario that seems quite likely possible is negligent and unacceptable. Even though chasing NAPL may be difficult, this effort appears insufficient to understand the NAPL location and movements in this area.

Further study needs to be done to determine if your interpretation is correct. While you're at it you need to do the same for the GWCS on the North side of the FPS. You haven't remove any DNAPL for several years there and you state the level has remained the same. ISTT has been conducted removing much contaminants to a diminishing return in both areas. We all understand diminishing return does not remove all of the contaminants and leaves a great deal. At the very least, extracting the DNAPL from MW 19 wells and the GWCS then observe whether DNAPL returns. This likely would help determine the course going forward. The question needing an answer is if it truly is in equilibrium or recharging the river?

> **EPA Response:** *Please see the responses offered above to Comment Letter #1 by the Pine River Superfund Citizen Task Force at comment bullet 8.*

You declared a Technical Impracticability Waver for DNAPL located in the till unit under the river. It didn't included sand seams within the Point of Compliance. If you aren't going to address the sand seams in the POC then how are you preventing the migration of site-related COCs from the unsaturated and saturated subsurface media to the groundwater or surface water beyond the point of compliance? Does this meet the specified requirement of FPS containment, achieve the containment RAOs, and address the risk to human health and the environment as specified in the OU1 ROD? This is more of a fundamental change and should require an amendment rather than an ESD.

EPA Response: *The 2012 Record of Decision requires a combination of containment, source control, and other measures, including replacement of the municipal water supply, groundwater monitoring, site restoration, and institutional controls to achieve the remedial action objectives defined in the ROD. As the Pine River Superfund Citizen Task Force knows the source control measures accomplished through application of in-situ thermal treatment and the excavations completed at the ANP and potential source areas 1 and 2 have been very successful. The commenter is correct, the 2012 Technical Impracticability (TI) Waiver does not cover the till unit sand seams located within the point of compliance. The source control measures already implemented are intended to greatly reduce or eliminate DNAPL flow through the till unit sand seams by removing it from the shallow unit, with the containment measures adding to this protection. Those systems will isolate the onsite shallow unit (via vertical barrier walls), remove groundwater and residual NAPL from the onsite shallow unit (via perimeter drain), and extract and treat groundwater from the lower units sufficient to achieve hydraulic capture of the groundwater in the lower unit (via design, construction, and operation of the groundwater extraction and treatment systems).*

The EPA and its regulatory partner EGLE are confident that the repair of the upgradient slurry wall and the removal of the MW-19 Area DNAPL collection trench from the OU1 Remedy will not fundamentally alter the overall remedial action for OU1.

The only soil samples taken were on the Easterly side of MW-19S. The downgradient flow direction inside the FPS goes to the river, which is a Westerly direction. Curious! Why none from the downgradient? A step out approach is typically what you have done when trying to determine the extent of contamination throughout your other investigations. That wasn't indicated in the documents.

<u>EPA Response</u>: *Please see the responses offered above to Comment Letter #1 by the Pine River Superfund Citizen Task Force at comment bullet 8.*

How was the conclusion in the TM reached when MW-19 has DNAPL in WPZ-061 exceeding Csat, SB004 (in a sand seam on top of the till), SB014 (in a sand seam on top of the till) and CMW-19S are positive for NAPL. It would be nice to have that answer.

<u>EPA Response:</u> *The conclusion reached in the <u>MW-19 Area Investigation Technical Memorandum</u> (CH2M 2023) is shown below:*

> *CH2M concludes that observed NAPL is likely attributed to isolated occurrences of locally trapped contaminants within or on the till surface. This conclusion also indicates observed NAPL lacks continuity across this area of the site and in the vicinity of MW-19.*

Though not stated directly, it seems the commentor is asking how that conclusion *was reached "when MW-19 has DNAPL in WPZ-061 exceeding Csat, SB004 (in a sand seam on top of the till), SB014 (in a sand seam on top of the till) and CMW-19S are positive for NAPL." Each is discussed below:*

- *As stated above in the response offered above to Comment Letter #1 by the Pine River Superfund Citizen Task Force at comment bullet 2, the DNAPL thickness was measured at 5-inches in July 2022, with additional measurements in August 2022 and January 2023 that indicated that the thickness of DNAPL was unchanged. The DNAPL thickness was measured again in August 2024 and again it was stable at 5-inches. In addition, there is a line of soil borings west (closer to the river) of CMW-19S1 that did not indicate any presence of DNAPL.*
- *Soil samples were not collected from WPZ-06I as it was installed by EGLE in 2002, therefore no soil samples were collected during the remedial design investigation from this location to exceed the C_{sat} concentrations. However, groundwater samples were collected from this piezometer and the data compared to the Michigan Part 201 water solubility criteria. During the April 2022 groundwater sampling event, the groundwater sample collected from WPZ-06I had a hexabromobenzene (HBB) concentration of 0.53 ug/L, which is above the water solubility criterion for HBB (0.17 ug/L). The HBB concentration at WPZ-06I was below the water solubility criterion during the July 2022 groundwater sampling event. No other analytes were detected at concentrations exceeding Michigan Part 201 water solubility criteria. DNAPL field screening was completed in 17 continuously sampled soil borings completed to the till surface with 34 soil samples collected and submitted for laboratory analysis. As described in the technical memorandum, none of the soil samples collected in the MW-19 Area Investigation exceeded the Michigan Part 201 C_{sat} criteria.*
- *SB004 and SB014 did have a positive NAPL test kit result at 18 feet and 17 feet below ground surface, respectively. A soil sample was collected from these depth intervals for each soil boring and submitted for laboratory analysis. These samples were collected within the shallow unit and not a sand seam in the till unit. The analytical results for the sample analyses for each location did not exceed the Michigan Part 201 C_{sat} criteria. A shallow unit monitoring well was set at each location, CMW-19S1 and CMW-19S2. The well screens were set approximately 1 foot into the till unit to act as a sump. As the technical memorandum described there is approximately 5-inches of DNAPL in CMW-19S1 and none in CMW-19S2. If there were more than residual DNAPL present in this area there would be more that 5-inches of DNAPL in the wells because there is approximately 7 inches of screen left to act as a sump. Based on the stable thickness of DNAPL in CMW-19S1 and the*

fact that there is no DNAPL in CMW-19S2 it is likely due to the presence of local residual DNAPL on the till surface.

I tried hard to keep this to one page but failed. I appreciate the EPA providing the public an opportunity to comment on the changes described in this proposed ESD. It is my understanding the EPA will prepare a response to comments received during this period and will be documented in a responsiveness summary. After looking for a definition of responsiveness summary and finding it I immediately felt like I was living behind the iron curtain or North of the Korean DMZ. By summarizing my public comment you have essentially censored me. You have summed up in your opinion what I am articulating and then preparing an answer based on your summarization. This is 100% unacceptable! My entire unaltered comments and questions I freely make and give anyone permission to read or publish. I do not give anyone permission to change any of my wordage used or the content. I expect my entire written comments to appear as an attachment in the ESD along with your response.

Gary J Smith
St. Louis, Michigan

Below are verbal comments from the Public Meeting on July 31, 2024, recorded by Robert J. Trudell, Certified Electronic Reporter, A Notary Public. These comments are also included in *Appendix E – Transcript of Public Meeting*.

<u>Verbal Comment #1</u>
By Mr. Seyka

MR. SEYKA: My question is, is the residential water line in the city of St. Louis, a lot of these houses have had their water lines in place for that type of an operation. The city of Flint is replacing water lines because of lead contamination. Are we still drinking contaminated water from our own water system? I think it's time for you all to test it. Thank you.

> ***<u>EPA Response</u>****: Lead pipes used within current municipal/residential water lines are not related to historical activities or by-products of the Velsicol Chemical Corporation and, as such, are not part of this Superfund Site or its remedy. However, the EPA believes all communities deserve access to clean, reliable water. The EPA requires all community water systems to prepare and deliver an annual water quality report. The City of St. Louis publishes these water reports for the public which are found here: https://www.stlouismi.com/government/public-works-and-utilities/water-department/.*
>
> *For more information, such as how to determine if you have lead pipes in your home, important steps one can take to reduce lead in drinking water, and how the EPA requires states and public water systems to protect drinking water, please follow this link: https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water#findout.*

Verbal Comment #2
by Ms. Jelenek

MS. JELENEK: This is about MW-19, and about the five inches of DNAPL that is collected in the bottom of it has remained steady for quite some time now. I think I would be more comfortable in giving up the idea of the collection trench on the side of the site if I knew that EPA had pumped out the five inches that are in there and see if it fills up again. Instead of just assuming that because it hasn't moved that nothing, there's no other reason for it than that it's just local residual stuff. And maybe it is. But I would feel more comfortable as a community person concerned about giving out the best cleanup possible if you could just pump out the five inches and see if it fills up again. Thank you.

EPA Response: *Please see the response offered above to Comment Letter #1 by the Pine River Superfund Citizen Task Force at comment bullet 8 and Comment Letter #6.*

____

Appendix E

EPA Revisions to Velsicol Chemical Superfund Site Cleanup Plan

PAGE 1 to 38

St. Louis, Michigan

Commencing at 7:00 p.m.,

Wednesday, July 31, 2024

Before Robert Trudell, CER-16210

St. Louis, Michigan
Wednesday, July 31, 2024
About 7:00 p.m.

MS. RUSSELL: Thank you all for coming. My name is Diane Russell, I'm with EPA Community Involvement, and I'm here to welcome you tonight. Just a couple housekeeping things before we kick things over to Jennifer to talk about what you all are probably interested in, and that's some of the changes to the cleanup plan we're going to be talking about tonight. Just a couple things, we have, for our meeting tonight, we have a court reporter, so that's not our usual meeting setup, but because we're in a public comment period, we want to make sure that we capture the information. Not only from tonight's meeting, but we're going to take time after the presentation and take questions and answer them. Then we're going to take a short break after that and then start the public comments. And our court reporter will be taking all comments, any oral comments that will be coming here tonight.

Now, as you may be listening to the presentation tonight that Jennifer's going to give, I have not only an agenda but also in the back there's a place for notes. So, as she's going along, if you have a question, write it down so you don't forget, we do have pens if you don't have a writing utensil. But we'll take questions after the conclusion of the presentation, just so we get all the information out. After the questions and answer portion we will move on to the public comment section. During this we can't respond to questions at that time because it will be considered a formal comment. So, just a couple things, again, we're going to kick things off and have a presentation with EPA's remedial project manager, Jennifer Knoepfle, and we also have some other folks with us tonight. I just want to point out Eric Martinson is here from EGLE as well.

Some other folks, we have some technical folks and other EPA folks here too, if any other types of questions come up. I'm going to hand it off to Jennifer.

MS. KNOEPFLE: Hello, everyone. Thank you for coming. I see a lot of familiar faces, that's great. So tonight, I'm going to be talking about the explanation of significant differences that EPA just put out to the public to talk about two changes that we're going to make to the overall remedy at OU1. And I will try to say explanation of significant differences all the time, but we also call it ESD. So, you'll hear me say ESD as well. So, I just wanted to point that out. So, we're basically going to address the repair that we would like to do in the upgraded slurry wall and then the removal of the DNAPL collection exception in the monitoring well 19 area.

So, DNAPL for those of you that aren't aware stands for dense non-aqueous phase liquid. So, I'll be using that word DNAPL a lot tonight. Basically, DNAPL is a liquid that's heavier than water. It's made up of a mix of chemicals and most of its volume is water. Okay, so we'll be talking a lot about DNAPL today. Oh, and then let me just get this picture going. So, just wanted to point out some of these pictures here. It's a historic picture from the mid '60s, that's kind of the height of Velsicol's production and chemical manufacturing that they were doing. And you can see out in the Pine River there's this white area, it's mostly magnesium oxide and DBT that's in the river. This one here is cleanup of the river that was conducted between 1998 and 2006. And then over here this was our excavation that we did on the former plant site this past 2023. We're just finishing up that whole thing, like growing the grass and doing the site restoration on that part of the site.

All right, so the agenda for what I'm going to walk you through tonight, and it's going to be about, you know, 40, 45 minutes, depending how fast I talk, are these six main criteria. So, the first one, I just want to go back and review the Superfund process and this post-ROD team. So, a ROD is a record of decisions, so R-O-D, ROD. And that was signed in 2012, and I think probably a lot of you were here for that proposed plan and the presentation of that. So, it's been 12 years, and so we're going to talk about what happens with the Superfund process when you want to make a change to the ROD, and why you can make a change to the ROD.

And then, we'll also go back and revisit the Velsicol site background. We'll look back at the record of decisions again and just kind of review. You know, it's been 12 years, so I want to review what the contaminants of concern are. We also call those COCs, what the remedial action objectives are, as well as the selected remedy. So, the remedy at OU1 is very complex. It's very big. There are 14 components to it. We haven't gotten through half of them yet, so I just want to make sure that we are all on board in understanding what was in that ROD and have a good review of that.

And then, the heart of the conversation tonight is number four, the basis for the explanation of significant differences. And we will go through both the upgradient slurry wall and the monitoring well 19 area. We're going to go through what's new, what were the change conditions that prompted us to make this change. And then we will, for both of these, talk about the lines of evidence. And then for the upgradient slurry wall, we'll talk about which repair technology we selected and why. And then finally, we'll end with the state of Michigan's input and then what the next steps are for the site.

All right, so let's start with the Superfund process. This graphic on the left, you read from top down, and, you know, basically, this first part is the assessment. We've already done that, and it was listed on the national priorities list. Most of you, I think, remember back in the early 2000s, the remedial investigation, which was, I think, completed in 2006, and then there was an addendum, or a remedial investigation addendum, in 2009. The feasibility study was completed in 2011, and then the proposed plan and the record of decision.

So, these things we've already completed, and right now we are here at this point for the entire Operable Unit 1 for Velsicol. So, parts of the site are in what we call the remedial design phase. So, we're designing, putting in the specifications and methods and means of how we are going to build, how we're going to do the excavation that we just did. Or like, you know, they did the same thing for the river, like how they were going to activate the soil, the sediment and remove it. So that all gets done in the design. And during the design phase, a lot of times we need additional data. So, we go back out and we do what we call pre-design investigations. And then that's followed by the remedial action. And there's a picture of an excavator here, that's the construction phase, that's when we're doing the work.

So, what happens during this remedial design portion is when we're doing those investigations, sometimes we will notice that there are change conditions for new information. And that is after this ROD is signed. So, what do we do, right? Well, with this new information, we find that it is significant or rises to the level where we have to evaluate the scope, performance, and cost. So, if the scope changes significantly, if the performance changes significantly, or the cost changes significantly, from what we described here in the ROD. Then we have to decide what kind of change do we have. Do we have something that's fairly minor? And if it's fairly minor, we usually write a tech novel or something, and that goes into the public record and goes into the file, and then we can just change that minor portion of the remedy.

If it's significant, which is what we have today, we prepare an explanation of significant differences. So, we prepare the document, especially for this site, because it's so large and complex. There's a lot of external interest in the site. There's a lot of local interest in the site. We have a public comment period, and we have this public meeting to basically get out the word that this is what we're doing, and also to hear back from all of you and hear comments on that.

And then after the public meeting, we finalize the document, and usually that entails putting all of your comments in there and responding to them, and then sometimes they're speaking to tables or figures if that's needed, and then depending on some of the comments, sometimes the specs can change as well. And then fundamental differences, that's when you might hear about a ROD amendment. That's when you're amending the original ROD, and that's fundamental. That's if you're completely just deciding, instead of in situ thermal treatment like we did, we're gonna actually address this with a different technology, and then address it in a different way. That would be a fundamental change.

All right, so here's a map called Superfund sites. I think we're all aware here, it's in St. Louis, Michigan. We are focused today mostly on OU1. So OU1 is composed of former plant site, and this sort of 12 square blocks of residential area that is next to it. And those are called chemical burn pits. The waste, both liquid and solids, were taken over here and burned periodically. And right now, we actually have in situ thermal treatment going on, which started in May. Well, it's operational in May, we actually started out building it earlier. And we're basically heating up the ground and extracting heat up all from that side of the site.

Velsicol Chemical, which we're gonna focus on tonight, is made up of four operable units. And that is what the ROD was written for. It was written for OU1, OU2 was a TCRA, or time critical removal action that was conducted in 1998 and 2006. And then we also have OU3, which is this stretch of river that's 1.25 miles from the dam to about here, 25 miles downstream. And then OU4 from here to the confluence of the Tittabawassee River. And it addresses the riverbanks and the flood planes in those areas.

The main features that we're gonna be talking about tonight, I just want to make sure we're all clear on where these are. What is the upgraded slurry wall? So, the slurry wall was put in in the early '80s as a result of a consent judgment in the United States and the state of Michigan and Velsicol. And tonight, we're gonna be focusing on the repair of that slurry wall in an area that has substandard performance and a breach. The other area that we're gonna talk about is the monitoring well 19 area, and that is over here. So, this purple outline, this is the area that thermal treatment was applied to this area. So, this area, we basically cooked off a significant amount of the DNAPL that was the source for contamination in this area. So, that was conducted in 2017, 2018. And the monitoring well 19 area is the area between the area that we cooked and the riverbank.

So, site history, I mean, we could probably talk for 45 minutes about the site history and the PBB crisis. So, I just want to give you a brief set up to the rest of the talk. But by no means is this meant to be comprehensive. Velsicol's industrial history stretches from the mid 1800s up to 1978. This part of Michigan has very rich salt deposits. So, the chemical manufacturing companies did a lot of experimentation with Bromine. On the site there is DCE dichlorobenzene and DDD dichlorodiphenyldichloroethane. Then there's the PBB crisis from 1973 to 1977. Velsicol accidentally shipped polybrominated biphenyl or PBB, a toxic flame retardant, to a livestock feed plant. The contamination went undetected for about a year, and millions of Michiganders ate contaminated meat, milk, eggs, and chicken. I always mention this book by Joyce Egginton called Poisoning Michigan. It's a great book and it goes into great detail.

So, after the destruction of the plants, they next put in a slurry wall, which was put around the entire site. So, the upgradient side, the land side that we're going to talk about today, is also on the downgradient side, which is in the river. And then there's a clay cap that's still present today. The idea was that was supposed to limit, significantly limit any rain or infiltration of water into the surface. That clay cap is not really doing its job because water does get in through today.

And then there was a water collection system that was running for a short period of time. It's not running now and hasn't in a long time. The rest of these actions, aside from this one, the reassessment OU2 sediment cleanup, the EPA did this. And then the state of Michigan did the remedial investigation and feasibility study, and then EPA wrote the OU1 ROD, and then we've taken remedial design and the implementation of the remedy system. And then this just has OU3 and OU4, we're working on those currently, as well as the study for the plant site.

All right, so real quick, let's go over the geology. I just want to break it down very easily for you. These are the three terms we're going to talk about today, lower unit, till unit, and shallow unit. Mostly, we're going to be talking about the shallow unit. So that's the top unit. It's basically made out of sand. It's where the groundwater is. You'll hear me talking about shallow unit groundwater. That's the groundwater that we're talking about when it sits in that sand. Underneath it is the till unit. That's a very permeable strata of geology. And so, the groundwater, for the most part, is not going to move down through the till unit. It's like it's holding most of the groundwater. Any DNAPL is usually sitting on the till unit. There are sand seams that are in this till unit. So, there's a till unit that does get to that. There's a preferential pathway to that. And then this lower unit also has groundwater, and that's part of the -- some of the points I'm talking about here.

And this is from the RI, the remedial investigation, that was done in 2006, and they did the addendum in 2009. And it's important because I just want to point out what contaminants we're looking at and in what medium they are. So, you know, the contaminants are in GW, which is groundwater. So, it's in groundwater and soil. And when they were doing their investigations, basically found volatile organic compounds, semi-volatile organic compounds, pesticides. There is PCBSA, it's written down here, this para-chlorobenzene sulfonic acid, but it's a lot easier to say PCBSA. That's a byproduct of DDE. It's not a surprise that this is in the groundwater. And then there was DNAPL. So, whenever they were doing borings, you know, a lot of DNAPL was noted during the RI. And when you're doing the remedial investigation, part of it is a risk assessment. And these chemicals when we send soil and groundwater to the lab, you get that back, become what we think gave contaminant concern is a very specific connotation. And basically, it's risk-drive. So, if these chemicals present a risk at a certain level, then they are considered a contaminant of concern or COC. And this is the list of those contaminants. And I don't think we necessarily need to memorize them, because we've pretty much talked about the risk-drive, the DDE, the PCBSA, and then DNAPL.

So, on Velsicol, there's two types of DNAPL, and like I said, DNAPL is that liquid that's very heavy, you know, a lot of times it's just going to travel through the shallow unit and sit on that till unit. And one type has very high concentrations of 1,2-DCA, PBB, PCBSA. And then the second type also has high concentrations that these are more fallible organics, like chlorobenzene. One of the things that the ROD does, so in 2012, there was a list like this in the ROD, if you go there, and then there's 12 remedial action objectives. So, these are the objectives that EPA needs to meet to say that this remedy is successful. So, this is why, this is what we're doing. The ones that we are going to be most concerned with are changes to the ROD for these four. So, preventing ingestion, inhalation, and direct contact of site-related chemicals of concern in groundwater, disputed, and eco-receptors.

The second one is to prevent the migration of site-related COCs from unsaturated in the statute of subsurface media to the groundwater or surface water beyond the compliance. The point of compliance to the PBB, is the boundary around what we want for the former plant site. So, anything beyond that, from the outside of it. We also need to restore groundwater beyond that point of compliance, basically the residential area. And this final one, eliminate off-site migration of DNAPL to prevent the contamination of surface water and re-contamination of sediments in the Pine River.

So those are our objectives that basically speak to the two changes that we're going to make. And these objectives are not changing. These are still the things that we need to meet for the remedy. Like I mentioned before, the remedy is 14 components, and it's very complicated, so I'm going to show you in this table, we're going to walk through the table, and then I have a graphic, a series of graphics that build on each other, and show you visually how you can do that. So, this remedy, the OU1 remedy, is basically containment and source control through treatment or removal. Those are the main pieces of the ROD and the OU1 remedy, that's what we focus on.

And then the green and yellow highlights, so the green highlight is this part of the remedy that's in progress. So right now, PSA is potential source area 1, potential source area 2. So those are the kind of the area of OU1. It's down on M46, it's growing grass nicely now, but we excavated over 120 tons of soil within the last year. And we're in the final phase of that, we're just waiting for the final report.

And then the yellow are the rep portions of the remedy that are complete. So, we are continuing operating of this DNAPL and groundwater collection system, but the reference here also, because I know there's a lot, and we try not to use a lot, but sometimes it would make the slide busier than it already is. So, this goes on, we collect DNAPL, in situ thermal for those areas in, on OU1, we performed that from 2017-2022, we removed over 380,000 pounds of DNAPL from the site. So that's all source material that was treated.

And then the AMP, this is the residential neighborhood, from 2014 to 2016, there were excavations of the yards up in that 12-block area, adjacent to the site. And then the bold text are the ones that we are working on now. So vertical barrier, we'll talk about that today. And then the MW19 area. So, they're going to look like this, and they're going to build on each other. Okay, so this is just a 3D cartoon, if you will, of Velsicol. And, you know, the yellow is the boundary around OU1. Here is where I keep talking about PSA 1 and 2.

The river is here, Pine River. And then we have the shallow unit, this is where the groundwater is. And we have the till unit, and then we have the lower unit, and we also have groundwater. And then we build on that. And so, this first part, this is what we've completed. This is the in situ thermal areas, there are two areas. This is area one and then this grouping here is area two. Again, that's where we heated up the ground and extracted over 380,000 pounds of DNAPL.

And then this next portion is the potential source areas. So, we have PSA 1 and 2, or these orange areas that were excavated. And then PSA 3 and 4, we have not addressed yet. So, these areas, as written in the ROD, will be addressed in the something called in situ chemical oxidation, where we inject into the ground, knock down the concentrations of those potential source areas. And then here's the vertical barrier wall. So, this is what we're going to be focusing a lot on later in the talk. So, the red and white line, this is going to be the steel sheet pile wall that we build. And that's on the downgradient side. So that's the side of the shoreline that's along the Pine River. And this will be heated or, you know, installed into the till units. So, the till unit will kind of be the bottom blockade, and then we have the steel sheet piles in the river. And this is mainly to keep any DNAPL that is onsite from going into the river. And that is its primary function, and that addresses one of those remedial action objectives. But then behind it, green, is the upgradient slurry wall.

So, this is the slurry wall that goes around the entire site, but we are just focusing on the upgradient portion. And this is the area that basically isn't prepared yet. So, there's a breach there, and then we just expand it out so that we can make sure we have all the leaking areas. And then here's the groundwater extraction and treatment system with the perimeter drains. And then we just, you know, everything else is kind of left out. So, you still see the in situ areas, you still see the PSA areas, and then the wall that's going around. And now we're adding in, so here's going to likely be the location of the wastewater treatment plant. And remember, this is all conceptual, so we're going to have an extraction system. And that extraction system are these ground lines that are on the site.

This doesn't mean this is where they are going. That comes during the design when we figure out, like, where do these lines need to go? How many do we need to have? That sort of thing. And then we have these areas, sorry, we have these wells where we will be extracting water from the lower, groundwater from the lower outwash unit, and then also from the shallow unit. And then this blue area, this is the perimeter drain. And the primary function of the perimeter drain is to keep the level of groundwater inside the barrier wall low. And then looking at this from the side, we also, part of the OU1 remedy, is this DNAPL pump to basically pump out DNAPL that's found in the lower outbox units. This is about 100 feet below the ground surface, and then this will be going into the ground load unit.

And finally, with the engineered cap. The engineered cap is basically eliminating any direct contact with any of the contaminants that are still on site. And then it also will limit any infiltration of rain and surface water that can go into the site. And so, you can still see from this. And then I want to just go through, without talking, and just put it forward for you. Let's go on to the upgradient slurry well repair. Just to remind you, we're going to be talking about this alignment. The other part of this is we're going to be talking about piezometers, which are also wells. They're just usually smaller diameter wells. And we installed wells on the inside of this slurry wall, and we installed wells on the outside of the slurry wall. And they basically started number one, and then go down here to number 42.

So, what is a slurry wall breach? We have a poster here that afterwards you can look at, if you want to look at it some more. The photo or the graphic on the left is kind of like our current situation and then this is what it should look like after it's repaired. So, you know right now this is the breach. We have a slurry wall that was poured, and it does not sit inside the till. We need it to sit inside the till so that groundwater is not going under the slurry wall.

And we can tell that because the groundwater table is the same here in this picture, you know, it's affecting groundwater where we're not having two different changes in elevation. Now over here where the slurry wall is going down into the till unit, so remember the till unit is very permeable. And then we have this perimeter drain. The perimeter drain is going to control the level of groundwater. So, this level of groundwater will be lower and then on the outside of the slurry wall, the outside of groundwater table will be higher. And you know groundwater always wants to go from high to low. So, the groundwater here, as long as we have this perimeter drain, it's going to want to flow from here on to the site.

So, we're not going to have -- it's not going to reverse. It's not going to go from the site where the contamination is off site. I wanted to make sure we were clear of that. And then here is a graphic that I want point out here. So, this is a blow-up of this area here. So, essentially at the corner of Saginaw and Watson, this area from the denominator group number 25 through 30 is represented here. And this is the area that's about 350 feet of substandard performance. And within that is this 20-foot breach.

So, if we go back to this picture, this is the 20-foot breach that we're seeing. And then all of these blue dots, these are the pairs. Sometimes there's more than a pair. These are clusters of all of the piezometers or wells that we are using to measure ground water. All right, so the vertical barrier wall description from the ROD is to install it, a vertical barrier needs to be around the entire perimeter of the site, decreased potential for DNAPL and dissolved base COCs, so that just means contaminated groundwater to discharge to the Pine River. The only thing that can do that is not the upgradient slurry wall because it does not flow from the upgradient part to the Pine River it's from the sheet pile wall that we are going to be installing, basically starting in construction season '25.

So, we're under contract, we're about to issue the award for that in August and then we will be installing the sheet pile wall. So, the sheet pile wall is what is going to decrease the potential for DNAPL and dissolved base COCs discharging to Pine River. And also in the ROD, the sheet pile was used as a representative vertical barrier technology and that is what we are going to use around the river, but we are not going to use that on the upgradient side and we will get to the reasons very shortly.

And then these are just a few other descriptions from the 2012 ROD where we needed to locate it outside of the current slurry wall and then install the perimeter drain. So, we are still going to be doing installing the perimeter drain. The sheet pile wall is going outside the slurry wall on the down gradient side. So, all of these are still going to be met. It's just that we're not installing the ground, sorry, the sheet pile wall around the entire perimeter. What happened was we basically started to see from all of the, like, the remedial investigation reports that there was plenty of evidence that showed that the down-gradient side was leaking, and we needed to repair it, and we needed the only way to do that was with the sheet pile wall.

The upgradient side, the evidence from the RI was very inconclusive. It was not complete. So, we went out in 2019 to 2020, and then again in 2022, and we did investigations so that we could design and figure out how we needed to address the up-gradient side. So, in 2019 to 2020, EPA went out and collected data, and we saw in that area of the corner of Saginaw and Watson over there that there was substandard performance. Groundwater was not active in the way that it should be if a slurry wall was acting as a barrier to groundwater flow.

So, we went back out in 2022 and kind of focused on that area where we knew groundwater was not active in the way that we knew that the barrier wall was working in the way that it should. So, there's many lines of evidence from those investigations. There's seven of them. We talked about that PSD document, and I will go through some of them, five of them today, and it's going to be pretty quick, but it's a lot of information, and it's very detailed. You can ask any questions afterwards, and you can talk about it, but I'm just trying to present it in a way that's understandable for everyone, without getting bogged down and showing, like, tables and tables, a lot of these are summaries that we're going to be showing.

And then, I put the conclusion here, basically, through these seven lines of evidence, you know, some are much stronger than others, but together, some support, you know, doing the repair completely on its own with just one line of evidence, but we have seven here. We found that the current upgradient slurry wall functions as part of the vertical barrier wall system. Upgradient slurry wall acts as a barrier to groundwater in most locations, except the identified area that leads from here.

All right. So, before there was ever a slurry wall, this is how groundwater would flow. So, the blue arrows are basically the direction of groundwater to flow. And, you know, we can see here that groundwater flow used to go across the neighborhood through the former plant site and into the river. So, it's flowing to this northwest direction. Then, in the early '80s, the slurry wall was installed. That's the red area here. What happened, and most importantly, is that this caused a groundwater divide. So, what that means is groundwater was still trying to flow in that northwestern direction, but then it hits the slurry wall, and so then it goes, it basically divides. So, this side goes up to the northeast, and this goes down to the southwest. And then, inside, these arrows are just showing, you know, there was leakage on the site from along this downgradient side. And then, here's the leakage that we are talking about.

And it's really important. So, this divide, I'm going to show you real data. There, there you go. We can see that divide today, still. I mean, this is our condition. So, these are contour lines, we take groundwater measurements. And, basically, groundwater flows from high to low, so it goes from the highest elevation down. So, you can see here, to 2015. So, this is after they shut off the municipal intake wells in the area. This divide is still present, and it's still present today. So, it's obviously in October 2016 and October 2020. We see it back in the RI. We'll look at those documents. You will see this divide there. So, groundwater has always flown, since the slurry wall, it's always flowed around, you know, basically, not through the site, but around this site.

So, we also measured groundwater elevation differences, and so I mentioned before that we had wells that were on the inside of that slurry wall and had wells that were on the outside of this slurry wall. So, what we did was we embedded the elevation, and basically if the bar graph is greater than zero, so all of these, zero is down here, all of these, this is the wells 1 through 13. Basically, it's called a positive hydraulic gradient, and it means it's flowing away, like it wants to flow away from the site. And the reason is, remember there's a cap on the site, it's not a very good cap, so water is infiltrating, and inside that groundwater is mouthing, or it's getting higher and higher and higher, and so groundwater always wants to go from high to low.

So, it wants to flow from the site out into the neighborhood. It's not going into the neighborhood; this is just showing the condition that we're seeing there. And we have graphs of this for all of the responders, and this is predominantly what we see, except we do not see this in the area of the leakage. So again, these are the positive hydraulic gradients, so we're just taking the inside well, and we're subtracting the elevation from the outside, or inside from the outside well. Here we have negative or very close to zero numbers. These are basically, the flow is towards the site. So, like I said, we have this mouthing on the inside of the site, and most of the wall. And then here, it's negative, and it's also showing this substandard upgradient slurry well effect.

So, this is where we have to reach, it's right around piezometer cluster number 28, but we are going to do the repair 25 through 30. So basically, where we start to see these positive gradients start up, so that we can repair this whole area, and then just to make sure that we have everything repaired, that needs to be repaired. Another piece of evidence that I'd like to share with you is the construction of the original slurry wall. So, in this picture here, we have another little support here that you can come look at later, through which the slurry wall is represented by this pink area. So, it's essentially a 10-foot block, right, this is in the cross section. This is almost like each of us, like an old photographic slide, right? And it was like in the ground, and you just pulled it out of the entire site and laid it down on the screen. This is what you would see, and you would see that this is the slurry wall here. And the slurry wall, for the most part, has been installed into the till unit, right?

Except for here, and this is by piezometer number 28. Here we see sand, and so the slurry wall was installed in the sand, so groundwater is able to go through the sand because it's not in the middle, and this is the breach that we see. And this is just a picture of showing the actual soil blade from number 28. And then one of the more compelling, I think, clients of evidence is the analytical data. These are showing analytical data. There's that groundwater divide again. So, this is the neighborhood, and these are the wells. We have data here we're showing from, literally since 2002 through 2020. But basically, for the last 20 to 25 years, in the neighborhoods, we do not see a problem.

The groundwater is going to be emanating from the site into this area. All of these are showing levels that are below what they're called the MCLs, maximum contaminant levels. But it's what our level is that we identified in the ROD that needs to be at. So, none of those of the site contaminants are found in the residential area. And then again, here we did some hydraulic conductivity testing to see how durable the current slurry wall is. Most of them, if we did in 2019 and we did investigation for 2022, to be impermeable, you might look at this 10 to the minus number. So basically, 10 to the minus 6 to about 10 to the minus 8, that is a very impermeable substance.

And out of these 11 samples, 10 of them are 10 to the minus 7, 10 to the minus 8, and one of those 10 to the minus 6. 10 to the minus 7 is important because that was from the consent decree that said it needs to be at least 10 to the minus 7 to the minus 6. So, we are needing that still in the slurry wall. And even this one 10 to the minus 6, which I think is here, it's still impermeable. 10 to the minus 6, that's something that groundwater doesn't hurt. From those investigations, we decided, okay, let's look at repairing this, what technology they're going to look at. And we have an engineering evaluation. We look at six repair methods for implement ability, effectiveness, and cost.

And we selected soil mixing. The implement ability is high because the materials are readily available. They're easy to get. The effectiveness is high. The design life, you know, is 75 years minimum. And then it also provides isolation. And then the capital costs, it's basically one-twentieth of the price. So, here's the six repair technologies that we've looked at. I highlighted the soil mixing, the steel sheet pile wall.

You know, this has a lifeline of maybe fifty years. It has a pretty high cost. These two, the slurry wall construction excavation, and they're on-caps crunching. Very high cost in comparison to the other types of technologies. Maybe not as implementable, as well as not necessarily as effective. This jet-frodding, we have to basically pick that one out right away because we can't install it individually. It's just impossible. And the tile wall is basically a fancy soil mixing. It has like a short amount of points to it that would be good for something like next to a river, but not necessary. So, we have some components to it that we don't really need, and don't really fit into this site's needs.

Here's the cost comparison. So, from the up-gradient portion of the rods, if you go into the rods, pull out the up-gradient portion of that barrier wall, and you escalate that cost from 2012 dollars to 2025 it's $22.6 million with steel sheet pile wall. In contrast, it's much cheaper to do the soil mixing and repair. So, MW19 area, just to remind you, this is over here on the side next to the in situ thermal area, where we extracted over 51,000 pounds of DNAPL in the lines of evidence that we collected in that pre-design investigation, including DNAPL screening, groundwater sampling, taking those level measurements, as well as conducting soil samples.

The conclusions from this are DNAPL in this area was addressed through the in situ thermal treatment in 2017 and 2018. That was a source of mediation that we did, this up-gradient of the MW19 area. Through our investigations, there are isolated occurrences of locally trapped DNAPL. DNAPL can be cooled off into vast pools, and it can also be very residual from tiny pores where it can't prevent pore pressure, and it just sits in that pore. There are many, many different concepts to how DNAPL presents itself to the subsurface, but based on our investigations, we think that these are isolated. And then, additionally, once we get the permanent grade in the groundwater treatment system, these will address the shallow unit of groundwater contaminants and keep any DNAPL that's in the DNAPL site.

These two areas that are highlighted in pink or red, these were the only two areas where they found the residual DNAPL. And we put in a monitoring well there, monitor and see what is that DNAPL doing. And we found five inches of DNAPL in that well, we looked over and sampled it, I think it was four times, you know, a year period, and that five inches never changed. What that's telling us is that it's not moving in, it's not increasing, there's not a source area that's bringing that in, and we wanted to add that extension to get the residual, it's not connected in the subsurface, it's likely the residual, and that's what it is.

Here's the area with the DNAPL that was treated, the source area was treated. Here's the MW-19 area. And then just remember that, you know, upcoming, the remedial design and the installation of this groundwater treatment system. That will also address any contaminated groundwater removal in that area. So, the state's perspective, Michigan, EGLE, District Department of Environmental Greatlakes and Energy, they concur with our remedy modifications. So, they reviewed all of our technical documents since the OU1 ROD. They reviewed the ESD document, and then they also provided a deterrence letter that's appendix B in that ESD. And finally, the next steps. So, we have the public comment period, July 15th, runs through August 13th at midnight. So, you can have all the time to submit comments through today. There's three ways to do it. You can send Diane mail with your written comment. You can make oral comments tonight, and you can also go on to that website.

We will review all the comments, submit, and respond to those in the responsiveness summary. That's going to be an appendix of the final ESD. Tonight, there's a court reporter. We will be providing the transcript. All of that will go into the appendix of the final ESD. And then the final ESD, that document scheduled to be finalized by such authority this year. And then these are our state contracts and that's all. Any questions?

UNIDENTIFIED: The graph, I didn't quite understand what I was looking at. So, you were talking about the flow and the inside and the outside. The bar graph.

MS. KNOEPFLE: This one?

UNIDENTIFIED: So, what am I really looking at? Is that on the inside of the slurry wall?

MS. KNOEPFLE: Right.

UNIDENTIFIED: So that's the elevation of the water inside the slurry wall?

MS. KNOEPFLE: So, if that's higher than the outside. The outside is -- you're going to have a positive number. We're taking the inside, and we're subtracting the outside, and we're getting this bar graph greater than zero. It means the water wants to flow away from the site. And then this area is the opposite. So, we're going to do negative hydraulic.

UNIDENTIFIED: So, it's only getting through that little breach?

MS. KNOEPFLE: Yes.

UNIDENTIFIED: Now, we know that the bentonite soil doesn't mix, it will erode. So, what you're putting back in as a repair is similar to what's already in there.

And you're patching one little spot, and then you're mixing, and I'm not sure how it's all going to be put together in there. Eventually, it's just going to be a bentonite wall. And it's going to possibly erode over time. Because water that is within the site, nothing inside that site is clean. The contamination will remain on site. So that is going to help erode the soil, the bentonite wall, and all of that in the future. And what we're not trying to do here is have y'all come back.

MS. KNOEPFLE: The other thing is, we're going to put in a perimeter drain. So, what's going to happen to this one is it's going to control the groundwater elevation on the inside of the site. And this is going to be outside of the site. The groundwater is going to go behind the wall. So, this groundwater is going to want to go into the site, all around the site. As long as we keep this groundwater elevation controlled by perimeter drain from the site. So, we're not going to be having groundwater lapping up against the slurry wall or lapping up against the sheet pile wall. It's going to be what we call an inward gradient, and groundwater is going to want to keep going in.

UNIDENTIFIED: I have a couple of questions. What is the lifespan of an upgraded slurry wall? And the second part is, what kinds of things or factors can lead to change in that lifespan or what kind of activity since you've told before it being vulnerable? So, it's already been in there a couple of years, so that means we only have another 30 years of that?

EPA REPRESENTATIVE: I'll chime in. That's the estimated design point. They can last a lot longer. 75 years is just the minimum depending on the situation. Don't forget, we're going to be monitoring. When it's prepared, it will be monitored. In those five-year reports that come out in every five years, we'll be indicating, you know, what the data is telling us, what the burden is going to be on any of it. We will be doing almost like a progress report on that type of review. And if we see degradation, then we will take action.

UNIDENTIFIED: Exactly, and so now you have to come back to the community.

MS. KNOEPFLE: Well, there's not a technology or a barrier that we can put in that's going to last forever. Even the sheet pile wall is about 50 years. It's something that we're going to monitor. The state also, you know, they don't want to be coming back and repairing things all the time either. But we're putting in the best technology and the longest iteration that we can.

UNIDENTIFIED: It's still old technology.

MS. KNOEPFLE: It's not old technology. Well, old is the sense that it was used in the '80s, but it's not old technology. It's used all the time. Well, I think a key point here as well that I think that we have to think about, especially in the agency, is what does the data say? And the data is showing an ample amount of evidence, multiple lines of evidence showing the effectiveness of that wall.

UNIDENTIFIED: Talk about soil. What are we talking about? What type of soil? How do they mix it? What do they put in it?

MS. KNOEPFLE: So, this is Rachel Mott. She's our design manager. She heads up all the designs.

MS. MOTT: So, they will go in ahead of time, and they will put in a few soil boards to make sure that they select the right equipment that can penetrate them first of all. And then, they might choose something like a drill rig with a column in it, they might choose a trencher, which is kind of like, you know, looks like a chain saw or two, a big piece of equipment. Something that will then, you know, we're going to go over the existing slurry wall, and they're going to drill down to get to depth. And then, as they're pulling the auger or trencher out, they're going to fill it. And so, they're going to mix that, you know, on site separately. And so, as they're pulling out their auger, they will fill that trench with that slurry mix.

So, they have to do all of this testing as part of the construction, to make sure that what is left behind will not degrade when it is exposed.

UNIDENTIFIED: So, the amount of bentonite that they actually mix in matters as part of the permeability?

MS. KNOEPFLE: Yes, and they will, you know, they will do testing before they even start doing the construction, to make sure that they come up with a mix design that will meet the permeability requirements. They will do additional testing while they're installing the wall, to make sure that it is meeting that permeability requirement.

UNIDENTIFIED: Just a follow-up question. Has CH2M done the slurry walls elsewhere?

MS. KNOEPFLE: CH2M are designers, the designers can't do those things.

UNIDENTIFIED: I just wondered if they've done slurry walls with bentonite mixes in other parts of the country?

MS. KNOEPFLE: Yes.

MS. RUSSELL: Well, I just wanted to mark the time. We're about five minutes past our original end time, but, you know, again, I just wanted to reiterate that if you have questions or, you know, you want to submit a formal comment, you can do that by the 13th, you can contact myself or go to Jennifer as well and continue with questions in that space as well. So, I just have one public comment. Instead of taking a formal break, I just want to check in with my court reporter real quick because I have one from Walter and he wanted to make sure he submitted a comment. So now I've got two, and we're just going to go ahead and move right into that. I just wanted to remind everyone we're not able to answer questions, because this is a formal comment part. We will respond to these, and as Jennifer mentioned earlier, in a document we call a responses summary. So, this will begin the oral comment portion of the meeting. And Walter, I'm going to have you stand up and I'm going to give you your information to the court reporter, so they can spell it correctly.

MR. SEYKA: My question is, is the residential water line in the city of St. Louis, a lot of these houses have had their water lines in place for that type of an operation. The city of Flint is replacing water lines because of lead contamination. Are we still drinking contaminated water from our own water system? I think it's time for you all to test it. Thank you.

MS. RUSSELL: All right, we have a second comment. Jane Jelenek.

MS. JELENEK: This is about MW-19, and about the five inches of DNAPL that is collected in the bottom of it has remained steady for quite some time now. I think I would be more comfortable in giving up the idea of the collection trench on the side of the site if I knew that EPA had pumped out the five inches that are in there and see if it fills up again. Instead of just assuming that because it hasn't moved that nothing, there's no other reason for it than that it's just local residual stuff. And maybe it is. But I would feel more comfortable as a community person concerned about giving out the best cleanup possible if you could just pump out the five inches and see if it fills up again. Thank you.

MS. RUSSELL: Anyone else want to submit a comment before I close the public comment portion of this meeting? All right, that concludes our meeting for this evening. Thank you so much for coming out tonight and listening to our presentation and sharing your questions and concerns. We greatly appreciate it. Again, the comment period is open until August 13th.

(Hearing concluded at 8:45 p.m.)

STATE OF MICHIGAN) SS

COUNTY OF BAY)

I, ROBERT J. TRUDELL, Certified Electronic Reporter, a Notary Public in and for above county and state, do hereby certify that the above hearing was taken before me at the time and place hereinbefore set forth duly recorded by me and reduced to computer transcription; that this is a true, full and correct transcript; and that I am not related to, nor counsel to any party nor interested in the event of this cause.

ROBERT J. TRUDELL
CER 16210 Notary Public, Bay County
My commission expires: 12/4/2030

S