Draft Final

Former Waste Oil Pit Feasibility Study Former Lordstown Ordnance Depot, Lordstown, Ohio

FUDS Property Number: G05OH0149-03

Prepared for

United States Army Corps of Engineers
Louisville District

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Prepared by

CH2MHILL®

Executive Summary

This feasibility study (FS) was prepared to assess remedial alternatives for the former Waste Oil Pit at the former Lordstown Ordnance Depot (FLOD) in Lordstown, Ohio. Along with the Burn Pit Area and Railroad Salvage Yard, the former Waste Oil Pit is one of three areas of concern (AOCs; collectively known as the 3 AOCs site) previously identified at the FLOD. The three AOCs were investigated as part of the *3 AOCs Comprehensive Investigation Report* (CH2M HILL, 2014). Remedial investigation results have indicated that contaminants present in groundwater at the former Waste Oil Pit may present risk exceeding U.S. Environmental Protection Agency's (EPA's) acceptable levels to human receptors. Risk estimates were within EPA acceptable levels at the other two AOCs identified during the remedial investigation, as documented herein. Therefore, this FS evaluates potential remedial technologies and risk mitigation strategies for the former Waste Oil Pit only.

This document includes the following elements:

- Summary of the physical characteristics, site history, results of previous investigations, nature and extent of contamination, and results from human health and ecological risk assessments
- Identification and screening of technologies
- Development of remedial alternatives
- Detailed analysis of alternatives

Description of Former Waste Oil Pit

The FLOD is located in a mixed area of industrial/commercial/residential land use within the Township of Lordstown, Ohio, in Trumbull County. The FLOD is bordered on the east by Ohio State Route 45, on the south by the Baltimore and Ohio Railroad, on the west by residential properties, and on the north by a mixture of residential and agricultural properties. Figure ES-1 provides an overview of the former Waste Oil Pit and pertinent features.

The site and surrounding area consist of gently rolling hills, small gullies, and ravines. Predominant vegetation includes native grasses and trees. In 1942, the Department of Defense (DoD) acquired the property and commenced construction of the depot. Before the existence of the FLOD, much of the land surface consisted of wetlands and swamp forests. The land surface was altered during construction of the FLOD and some of the low-lying areas and wetlands were filled and graded.

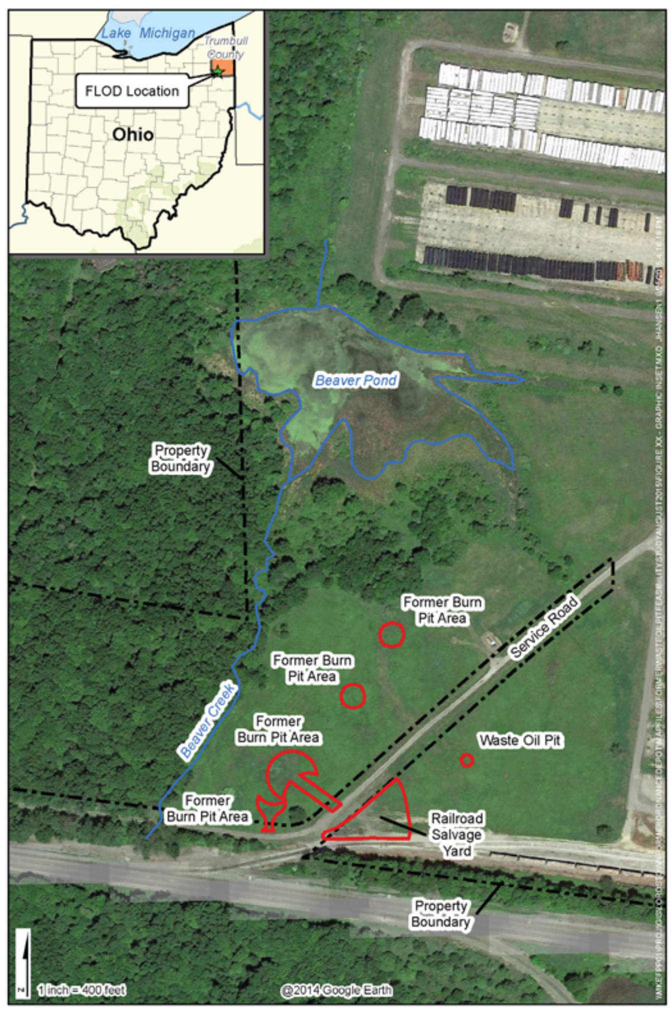


FIGURE ES-1
Site Overview

The DoD used the former Waste Oil Pit AOC during the 1950s to dispose of petroleum products (such as waste motor oil and waste gasoline), waste paints, and spent solvents. The pit was circular in shape with an approximate diameter of 30 feet.

The topography at the former Waste Oil Pit is relatively flat, with an elevation range between 940 and 945 feet above mean sea level. In general, the land surface slopes gently from south to north with a localized high point near the former Waste Oil Pit. Beaver Creek, an ephemeral stream, is located to the west and northwest of the former Waste Oil Pit and flows into Beaver Pond, which is north of the site (Figure ES-1).

Subsurface conditions within and around the former Waste Oil Pit consist of shallow surficial soils underlain by a fractured sandstone and shale bedrock formation. The thickness of surficial soil varies considerably within FLOD; however, bedrock is encountered approximately 5 to 7 feet below ground surface (bgs) in the former Waste Oil Pit area. The depth to groundwater across the investigation area is typically between 1 to 5 feet bgs and fluctuates between 1 and 2 feet in response to seasonal variations in precipitation. In general, groundwater flows to the north-northwest across the area, but groundwater flow is influenced by bedrock topography, which causes south to north-northeast flow in some areas.

Nature and Extent of Contamination

Soil

Surface and subsurface soil investigations were completed at the former Waste Oil Pit in 1995, 1996, and 1997. Volatile organic compounds (VOCs) (including trichloroethylene [TCE], tetrachloroethene, and 1,2-dichloroethene [DCE] containing both cis and trans isomers), 1,1,2-trichloroethane, petroleum hydrocarbons (including toluene, ethylbenzene, and xylenes) were detected in surface soil and subsurface soil samples collected from the former Waste Oil Pit. TCE was the most prevalent compound detected, with a maximum observed concentration in subsurface soil of 79,000 milligrams per kilogram. In addition, soil samples indicated the presence of 2-hexanone, acetone, bromomethane, chloromethane methylene chloride, and naphthalene. Polycyclic aromatic hydrocarbons (PAHs) and pesticides were detected in surface soil samples from 10 locations. Several metals, including barium, calcium, lead, manganese, nickel, and sodium, were detected above background levels in at least one sample.

Groundwater

Twenty-four monitoring wells, including two deeper wells completed in bedrock, have been installed to identify potential groundwater contamination associated with the former Waste Oil Pit and to characterize the nature and extent of site-related contamination. Groundwater near and downgradient from the former Waste Oil Pit was found to contain mostly TCE, cis-1,2-DCE, and vinyl chloride. Contamination appears to be limited to a maximum depth of 36 feet and extends approximately 450 feet downgradient from the former Waste Oil Pit. Sample data indicate that concentrations have decreased since 2000 and that the plume has not expanded since that time.

Bedrock

Several contaminants, including VOCs and PAHs, were detected in samples collected from the bedrock beneath the former Waste Oil Pit. Nonaqueous phase liquid (NAPL), consistent with weathered waste oil, was also observed in bedrock in the vicinity of the former pit. The volume of recoverable NAPL, however, was insufficient to generate a sample for laboratory analysis; boring observations suggest NAPL is present in an immobile, residual phase. The vertical extent of NAPL in the center of the former Waste Oil Pit was observed to extend to a total depth of 24 to 26 feet bgs.

Risk Assessment Summary and Remedial Action Objectives

Several risk assessments have been completed for the former Waste Oil Pit site, including evaluations by Shaw Environmental (2006) and CH2M HILL, Inc. (2011; 2014). In support of FS completion, CH2M HILL rescreened site data in May 2015 (using the EPA's Regional Screening Levels from January 2015) to update the contaminants of potential concern (COPCs) and recalculate risk estimates for outdoor industrial workers[1] to identify contaminants of concern (COCs) at the three AOCs identified at the FLOD. The results of this re-screening are as follows:

- Future industrial outdoor workers—surface and subsurface soil (ingestion, dermal contact, and inhalation) and groundwater (drinking water and hand-washing)

  Soil: cumulative excess lifetime cancer risk (ELCR) and hazard index (HI) for soil at the site was within the EPA acceptable risk range. As a result, no soil COCs were identified.

- Future residents (adult and child) who live near the site – groundwater (via drinking water and showering or bathing)

  Groundwater: ELCR of 5×10^{-2}, HI of 188 (child), and HI of 119 (adult) exceed the EPA acceptable risk range and threshold HI. Noncarcinogenic COCs are cis-1,2-DCE, TCE, and vinyl chloride. Carcinogenic COCs are benzene, benzo(a)pyrene, bis(2-chloroethyl)ether, bromodichloromethane, chloroform, dibromochloromethane, naphthalene, TCE, and vinyl chloride.

In summary, soil risk estimates for future outdoor industrial workers at the former Waste Oil Pit (as well as at the other two nearby AOCs) site are within the EPA acceptable risk range and threshold HI; however, groundwater risk estimates exceed the EPA's acceptable range and threshold HI. In addition, volatile constituents in the vadose zone or groundwater could migrate into hypothetical future buildings constructed on-site and migrate offsite into buildings and pose vapor intrusion risks exceeding EPA's target risk range or threshold HI. Therefore, the following 10 groundwater COCs were included in the FS for potable use and vapor intrusion: benzene, benzo(a)pyrene, bis(2-chloroethyl)ether, bromodichloromethane, chloroform, cis-1,2-DCE, dibromochloromethane, naphthalene, TCE, and vinyl chloride. Although ten COCs were identified, the FS focuses primarily on TCE and its daughter products because they are the most extensive and alternatives that address them also will address other COCs.

There are no buildings onsite currently. Discussions with the property owners indicate that construction of future buildings onsite is unlikely, since a structure in this area would inhibit future rail access. Based on results of the revised risk screening, the following remedial action objectives (RAOs) were established for this FS:

- Soil:
  - Reduce the mass and distribution of source material in soil and underlying bedrock to prevent further degradation of site groundwater and promote reduction of dissolved-phase COCs.
  - Reduce the VOC concentrations in soil to mitigate the potential for vapor intrusion.[2]

[1] A meeting was held with the current property owner (Ohio Commerce Center and Routh-Hurlbert, representing Ohio Commerce Center's real estate developers), USACE, and the Ohio Environmental Protection Agency on December 4, 2014. The property owner indicated that the site is currently zoned industrial/commercial. The Ohio Commerce Center is being marketed as a rail property and they are not actively marketing the 3 AOC area. The only reasonable, foreseeable future site use for the 3 AOC site is potential rail expansion (rail spur to the main line) near the Waste Oil Pit.

[2] It should be noted that bulk soil data is not recommended for estimating the potential for vapor intrusion (EPA, 2015).

- Groundwater:
  - Promote continued reduction of dissolved-phase COC concentration through source treatment.
  - Prevent ingestion, inhalation, and direct contact with COCs in groundwater that present unacceptable risk to human receptors.
  - Reduce the concentrations of COCs in groundwater to mitigate the potential for vapor intrusion.

Development of Remedial Alternatives

Based on site conditions and the RAOs established, the following remedial technologies were retained for incorporation into remedial alternatives for treatment of the former Waste Oil Pit AOC:

- No action
- Excavation, land use controls (LUCs), and monitored natural attenuation (MNA)
- In Situ treatment
- In Situ thermal treatment (ISTT)

These alternatives were assembled into separate remedial alternatives to address subsurface contaminants in the source area which includes the lateral and vertical extend of residual contamination within the former Waste Oil Pit area and the associated dissolved contamination present in downgradient groundwater:

Source Area Soil and Groundwater

- Source area (SA)-1 No Action
- SA-2 Excavation, LUCs, and MNA
- SA-3 In Situ Treatment
- SA-4 ISTT

Downgradient Groundwater

- Groundwater (GW)-1 No Action
- GW-2 LUCs, Long-term Management, and MNA
- GW-3 In Situ Treatment

Assembled alternatives for the former Waste Oil Pit were evaluated for seven of the nine criterion as stipulated by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Evaluation of state and public acceptance criterion will be deferred and integrated into the responsiveness summary that will be prepared following completion and comment of the Proposed Plan. Evaluation results are summarized in Table ES-1. Excavation, LUCs, and MNA of the source area evaluated under SA-2 was determined to be the least expensive alternative that fulfilled all evaluation criterion. Like SA-2, in situ treatment offered under SA-3 satisfied all criterion; however, the alternative was the slowest to achieve the remedial goals established for the site, based on the results of the FLOD Flow and Transport Model. In situ thermal treatment (SA-4) fulfilled all evaluation criterion and was projected to provide the highest short- and long-term effectiveness given the ability to treat contaminants that reside in both soil and fractured bedrock. Accordingly, SA-4 also offered the lowest potential for concentration rebound following treatment. Short- and long-term effectiveness of SA-2 was considered to be lower than SA-4 but greater than in situ treatment (SA-3), since excavation would target removal of contaminant mass rather than treatment.

The application of thermal treatment (SA-4) to the source area was considerably more expensive than SA-2 and SA-3. Despite increased cost, SA-4 produced the shortest time to reach remedial goals and offered the highest certainty for short- and long-term effectiveness among all alternatives considered. Source area excavation with LUCs and MNA (SA-2) resulted in rapid achievement of remedial goals and possessed the lowest cost of all alternatives considered. Overall, SA-2 provided significant reduction in contaminant volume in the former Waste Oil Pit through removal and offsite disposal. Conversely, SA-3 and SA-4 achieved reduction in contaminant mobility, volume, and toxicity using treatment that is generally preferred by the NCP.

TABLE ES-1

Comparative Analysis Summary – Groundwater Alternatives

Former Waste Oil Pit Feasibility Study, Former Lordstown Ordnance Depot, Lordstown, Ohio

Alternative	Protection of Human Health and the Environment	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction of Mobility, Toxicity, or Volume through Treatment	Short-term Effectiveness	Implementability	Cost[2]
SA-1 No Action	No active treatment	No active treatment	No active treatment	No active treatment	No active treatment	Meets criteria	**$0**
SA 2 Excavation, LUCs, and MNA	Meets criteria	Meets criteria	Meets criteria	No active treatment	Meets criteria	Large excavation volume required	**$2,751,000**
SA-3 In Situ Treatment	Meets criteria	Meets criteria	Meets criteria but with lower certainty	Meets criteria	Meets criteria but with lower certainty	Meets criteria	**$3,150,000**
SA-4 In Situ Thermal Treatment	Meets criteria	Meets criteria	Meets criteria	Meets criteria	Meets criteria	Extensive subsurface infrastructure requirements	**$5,260,000**
GW-1 No Action[1]	No active treatment	No active treatment	No active treatment	No active treatment	No active treatment	Meets criteria	**$0**
GW-2 LUCs, Long-term Management, and MNA[1]	Meets criteria	Meets criteria	Absence of active treatment extends remedial timeframe	MNA efficacy is reduced over active treatment	MNA duration is extended over active treatment	Meets criteria	**$1,947,000**
GW-3 In Situ Treatment	Meets criteria	Meets criteria	Meets criteria	Meets criteria	Meets criteria	Meets criteria	**$2,280,000**

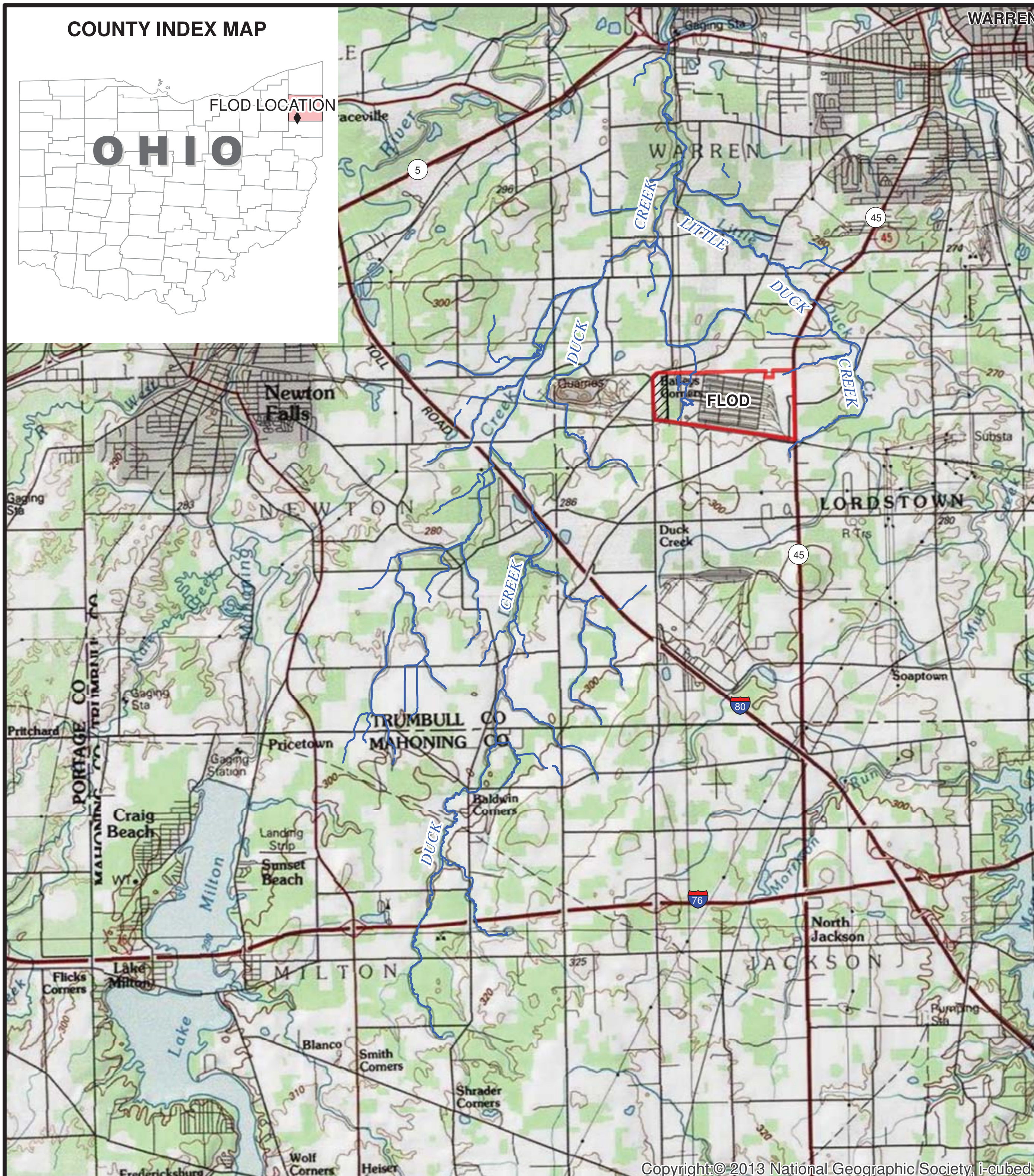
Notes:

[1] Alternative will not meet criteria in the absence of source area treatment, but may meet criteria if combined with source treatment.

[2] Reported cost represents total present value of alternative.

ARAR = applicable or relevant and appropriate requirement
GW = groundwater
ISCO = in situ chemical oxidation
LUC = land use control
MNA = monitored natural attenuation
RAO = remedial action objective
SA = source area

Criteria are not fulfilled
Criteria are fulfilled
Criteria are partially fulfilled



NOTE:

FLOD = FORMER LORDSTOWN ORDNANCE DEPOT

LEGEND

FLOD BOUNDARY

FLOD PROPERTY SURPLUSED IN 1945

0 4,000 8,000 12,000

Feet

N

FIGURE 1-1
SITE LOCATION MAP
FORMER WASTE OIL PIT FEASIBILITY STUDY
FORMER LORDSTOWN ORDNANCE DEPOT,
LORDSTOWN, OHIO

CH2MHILL

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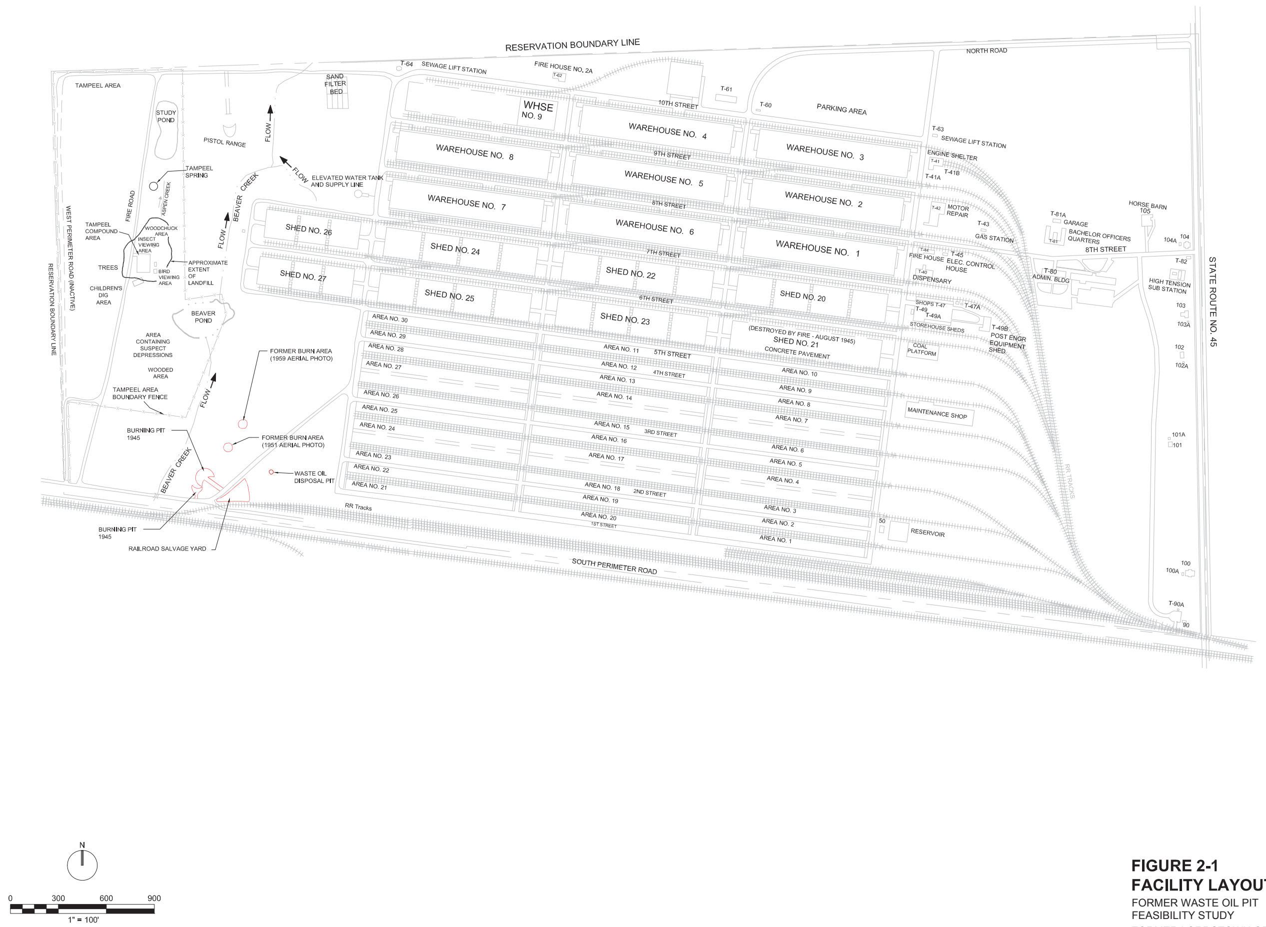


FIGURE 2-1
FACILITY LAYOUT MAP

FORMER WASTE OIL PIT
FEASIBILITY STUDY
FORMER LORDSTOWN ORDNANCE DEPOT
LORDSTOWN, OHIO

CH2MHILL

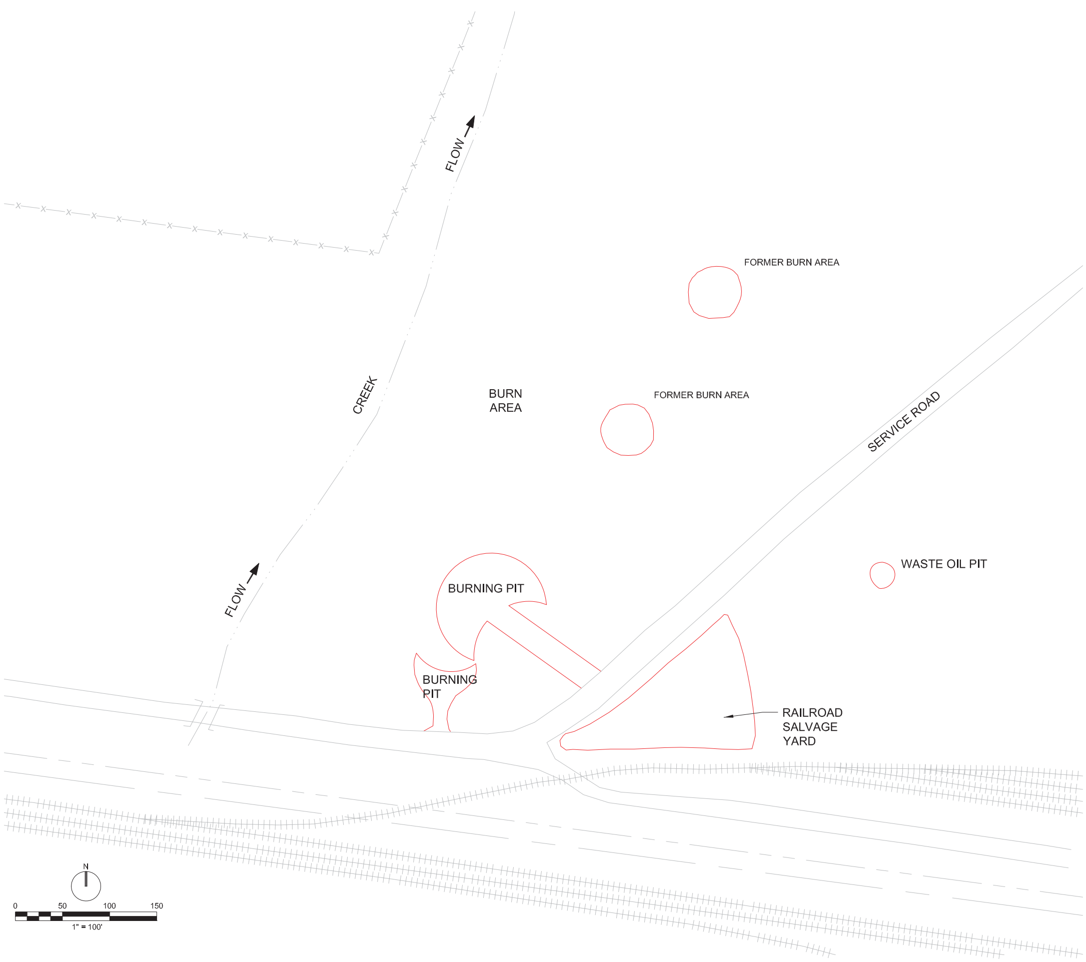


FIGURE 2-2
AREAS OF CONCERN
FORMER WASTE OIL PIT
FEASIBILITY STUDY
FORMER LORDSTOWN ORDNANCE DEPOT
LORDSTOWN, OHIO
CH2MHILL

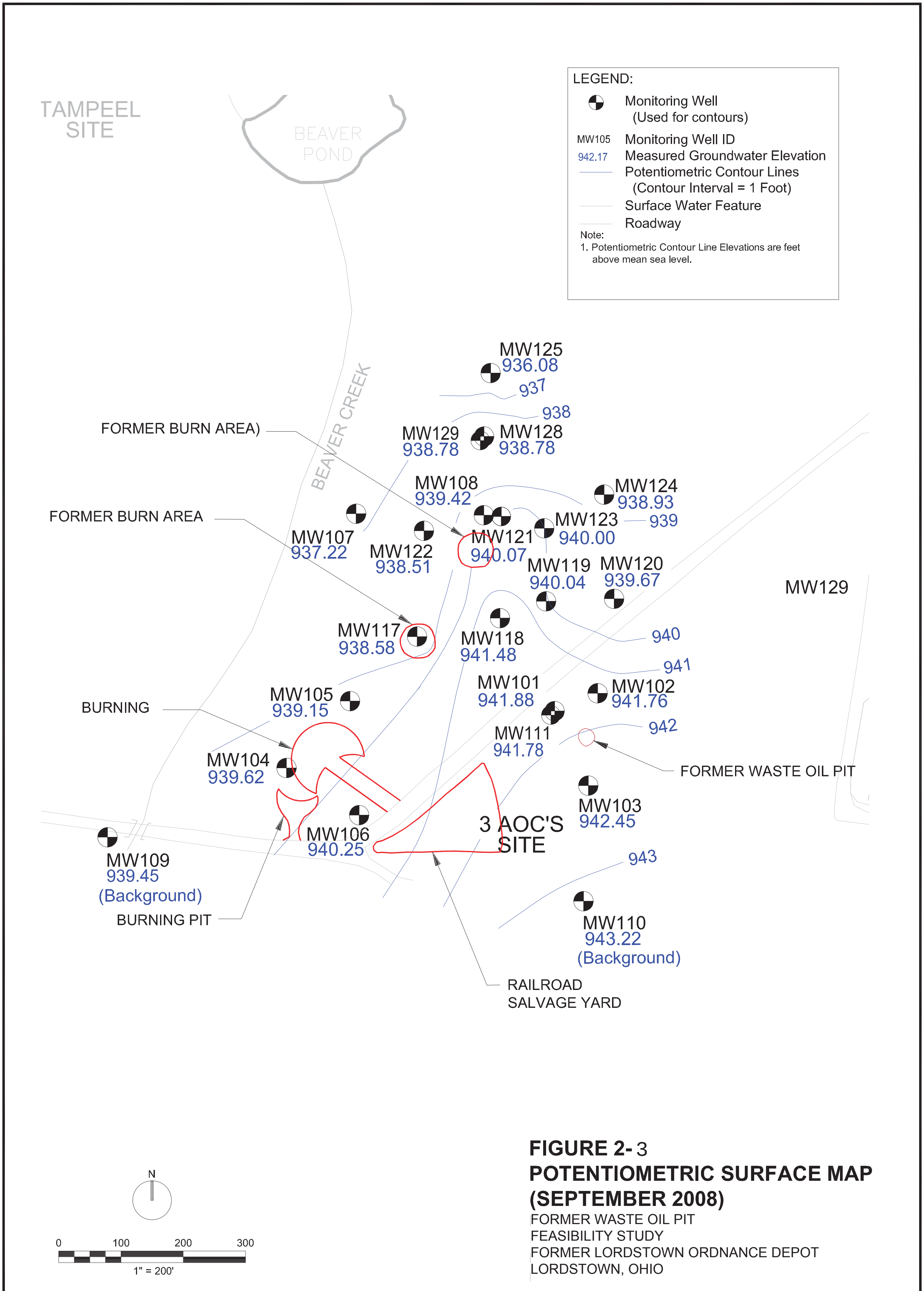
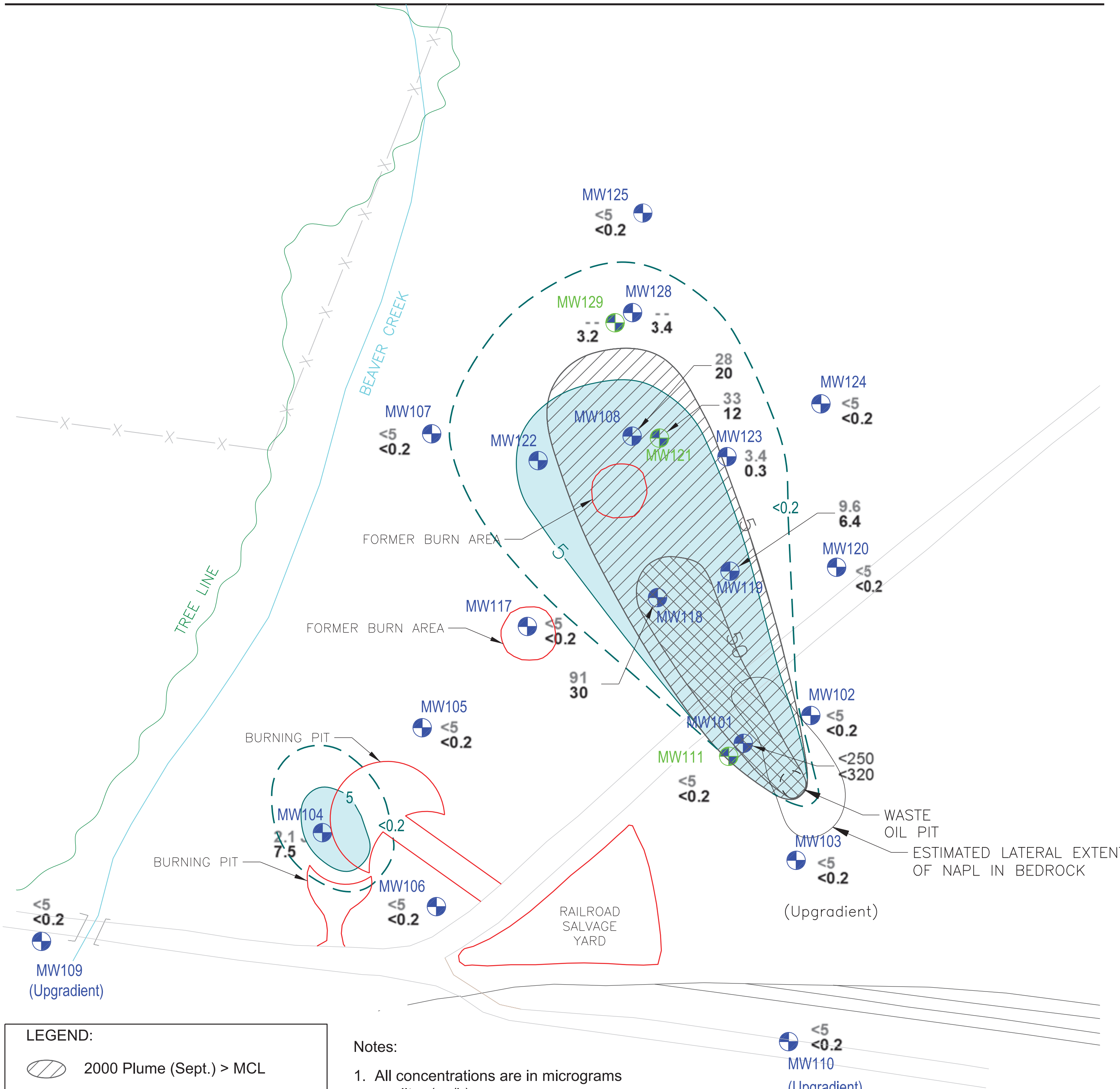


FIGURE 2- 3
POTENTIOMETRIC SURFACE MAP (SEPTEMBER 2008)

FORMER WASTE OIL PIT
FEASIBILITY STUDY
FORMER LORDSTOWN ORDNANCE DEPOT
LORDSTOWN, OHIO

CH2MHILL



LEGEND:

- 2000 Plume (Sept.) > MCL
- 2000 Plume (Sept.) > 10X MCL
- 2008 Plume (Sept.) > MCL
- 2008 Plume (Sept.) > 10X MCL (No Exceedances for This Event)
- 2008 Plume (Sept.) > RL
- Existing Monitoring Well
- Existing Deep Monitoring Well

North

50 0 50 100

scale in feet

Notes:

1. All concentrations are in micrograms per liter (ug/L).
2. 2000 Concentrations are shown in Gray. Reporting Limit (RL) = 5 ug/L. 2008 Concentrations are shown in Blue. Reporting Limit (RL) = 0.2 ug/L.
3. Monitoring wells MW128 and MW129 were installed in 2007.
4. Monitoring wells MW127 and MW130 were installed in 2009.
5. Dashed Contours are the Approximate Extent of Detections (based on the RL).

FIGURE 2-10

TRICHLOROETHENE ISOCONCENTRATION MAP - SEPTEMBER 2000 VS. SEPTEMBER 2008

FORMER WASTE OIL PIT

FEASIBILITY STUDY

FORMER LORDSTOWN ORDNANCE DEPOT, LORDSTOWN, OHIO

CH2MHILL

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