PREFERRED PLAN

FOR THE REMEDIATION OF THE UNION TANK CAR SITE
939 HOLLAND ROAD
MARION, MARION COUNTY, OHIO

Division of Environmental Response and Revitalization
Northwest District Office

January 2023

Site Clean Up Process and Preferred Plan Announcement

Ohio EPA's Division of Environmental Response and Revitalization (DERR) - Remedial Response Program			**Preferred Plan for the Remediation of the Union Tank Car Site Marion, Marion County, Ohio**		
THE REMEDIAL RESPONSE PROCESS					
(1) Preliminary Assessment & Site Inspection	**(2)** Remedial Investigation & Feasibility Study	**(3)** Remedy Selection (Preferred Plan & Decision Document)	**(4)** Remedial Design	**(5)** Remedial Action	**(6)** Remedy Operation, Maintenance & Monitoring

This Preferred Plan is being provided to the public for comment, as part of the site clean-up process. The Preferred Plan summarizes site information, evaluates the options for clean-up, and identifies Ohio EPA's preferred option. Based on public comments or additional information received, Ohio EPA may modify the preferred remedial alternative or select another alternative. Therefore, the public is encouraged to review and comment on this Preferred Plan. Once the final remedial alternative is selected, the Ohio EPA Director will issue a Decision Document, defining the final remedy.

Public Comment Process

Public Comment Period: ***January 26, 2023 – March 8, 2023***. Ohio EPA will accept written comments on the Preferred Plan during the public comment period.

Public Meeting: Ohio EPA will hold a public meeting to explain the Preferred Plan. Both oral and written comments will be accepted at this meeting, which will be held on ***Wednesday, March 1, 2023,*** at ***6:00 PM*** at Harding High School, located at 1500 Harding Hwy East, Marion, Ohio 43302.

Additional Information: Available from Ohio EPA's Northwest District Office, located at 347 North Dunbridge Road, Bowling Green, Ohio 43402, Lynn Ackerson, 419-373-4113, lynn.ackerson@epa.ohio.gov;

EXECUTIVE SUMMARY

On December 5, 2007, Union Tank Car signed Director's Final Findings and Orders (DFFOs) with Ohio EPA to investigate the extent of contamination and, if appropriate, develop remedial alternatives to address the problem for the Union Tank Car (Site) located at 939 Holland Road, Marion, Marion County, Ohio.

The Site has operated as a railroad service facility since the early 1900's. Historical operations included the classification and staging of railcars and the repair and fueling of locomotives. Operations since 1980 involve the cleaning and repair of railroad tank cars. The Remedial Investigation (RI) documented the existence and levels of contamination at the Site. A Baseline Human Health Risk Assessment (BHHRA) was conducted as part of the RI to provide an evaluation of the potential threat of Site contamination to human health and the environment in the absence of any remedial action. Based on the BHHRA for the Site, Ohio EPA has determined that remedial action is necessary at this Site and has prepared this Preferred Plan describing the remedial actions proposed for the Site. Additional details on the Site investigations, primary contaminants of concern (COCs), and risks evaluated are provided in this Preferred Plan.

A Feasibility Study (FS) was conducted for the Site, and Remedial Action Objectives (RAOs) and clean-up standards were developed to address human health and environmental risks posed by COCs at the Site. Primary COCs include volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC) with exposure-based cleanup standards called preliminary remediation goals (PRGs). Remedial alternatives were proposed to achieve these RAOs and PRGs.

This Preferred Plan summarizes the range of remedial alternatives evaluated, identifies Ohio EPA's preferred remedial alternative, and explains the reasons for selection of the preferred remedial alternative. The Ohio EPA has selected Alternative 4 (Alternative 3A in the FS) consisting of Soil Alternative 3 (S3), Ground Water Alternative 3 (G3), and Indoor Air Alternative 3 (IA3 (Alternative IA3A in the FS)), as described in Section 6.0, as the preferred remedial alternative. This Preferred Plan is issued consistent with Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The expectations for the preferred remedial alternative include:

1. Protection of human health and the environment, in the short-term and long-term, from exposure to COCs above acceptable limits in contaminated media.
2. Compliance with applicable or relevant and appropriate requirements (ARARs).
3. Reduction of the toxicity, mobility, or volume of contaminants through treatment.
4. Cost-effectiveness and limitation of expenses to what is necessary to achieve the preferred alternative expectations.
5. Continued operation and maintenance of the existing monitoring systems.

The major elements of the preferred remedial alternative include:

1. An environmental covenant that:
    a. Limits the property to commercial/industrial use.
    b. Prohibits ground water use for any purpose other than sampling to monitor contamination until such time as ground water is restored.
    c. Requires implementation of engineering controls.
    d. Prohibits occupancy of a building without Ohio EPA approval.
2. In-situ chemical/biological treatment.
3. Light nonaqueous phase liquid (LNAPL) collection/pumping followed by natural source zone depletion (NSZD) to address residual LNAPL.
4. Soil vapor extraction (SVE) system.
5. Vapor barrier and passive and active (contingent) sub-slab depressurization systems (SSDS)
6. Indoor air/sub slab monitoring.
7. Long-Term ground water monitoring and additional wells, as needed, for remedy performance monitoring.
8. Monitored Natural Attenuation (MNA) of soil and ground water.
9. Risk Mitigation Plan (RMP).

Ohio EPA anticipates that these measures will protect public health and the environment by reducing Site risks to acceptable levels once the RAOs have been achieved.

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2.0 SITE CONDITIONS SUMMARY

2.1 Site History and Description

The Site is located in a primarily commercial and industrial area on approximately 160 acres at 939 Holland Road, Marion, Ohio, as shown in **Figure 1 Site Location Map** and **Figure 2 Site Map**. The Site is zoned for industrial use by the City of Marion and has been used for industrial purposes for approximately 100 years. There is a private water supply well downgradient of the Site, and the majority of the Site is in the inner management zone of the source water protection area for the Ohio American Water Company well field located less than one mile northwest of the western portion of the Site.

The unconsolidated geology at the Site consists of fill materials underlain by gray, brown or sometimes black silty clay with varying amounts of sand and gravel. Bedrock on-Site consists of Devonian-aged Columbus Limestone, which is a fossiliferous and massive limestone interbedded with laminated shale. Ground water at the Site has been classified into two hydrostratigraphic units: Till/Bedrock Interface (TBI) and the Shallow Bedrock. The ground water flow direction in the TBI Unit is generally west to west-northwest. The ground water flow direction in the Shallow Bedrock is generally to the west towards the Little Scioto River. While the water elevations varied by season, no seasonal variations were noted in the ground water flow directions in the TBI Unit or the Shallow Bedrock. The water levels in the TBI Unit are generally higher than those in the Shallow Bedrock indicating the presence of downward vertical gradients from the TBI to the Shallow Bedrock. The TBI Unit ground water velocity ranges from approximately 0.2 feet per day (ft/day) to 0.8 ft/day (geometric mean). Calculated ground water velocity for the Shallow Bedrock is estimated at 0.3 ft/day (geometric mean).

The Site has been used for railroad related activities since at least the early 1900s, first by the Erie Railroad (including the classification and staging of railcars and the refueling of locomotives), until a merger created the Erie-Lackawanna Railroad in 1960. The Erie-Lackawanna Railroad entered bankruptcy in 1972. The property was purchased by Berwind Railway Service Company (Berwind) on May 10, 1978. These operations contributed to the release of contaminants including but not limited to diesel, fuel oil, metals, and VOCs at the Site. In 1981, Ohio EPA investigated a complaint and found nine open drums of petroleum-based waxes and liquid detergents stored on pallets at the Site. Berwind operated the property until it sold tracts of land, subject to certain leases, to the Union Tank Car Company in 1982. The Site is currently owned by Union Tank Car Company and is used for the cleaning and repair of railroad tank cars and warehousing by the Marion Industrial Center.

Prior remedial activities at the Site include the removal of 899 cubic yards of lead-contaminated soil from the Site in 1996 by Union Tank Car. Post excavation confirmation samples were collected to ensure that the remaining soil did not contain more than 400 milligrams per kilograms (mg/kg) lead. Perimeter samples were also collected outside the excavation and screened using x-ray fluorescence (XRF).

In September 1998, Ohio EPA conducted a sampling event at the Site as part of the Marion Geographic Initiative. Ground water samples were obtained from five (5) locations on Site. Laboratory analysis of ground water samples collected from these locations indicated levels of VOCs, SVOCs, and metals in excess of maximum contaminant levels (MCLs) of vinyl chloride, 1, 2-dichloroethane, carbon tetrachloride, 1,2-dichloropropane, 1,1,2-trichloroethane, benzene, hexachlorocyclopentadiene, antimony, arsenic, chromium, lead and thallium. Soil samples collected during the same event indicated contaminant levels of VOCs, SVOCs and metals in excess of U.S. EPA Region 9 Industrial Soil PRGs. The specific exceedances in soils at the Site are as follows: benzene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a, h)anthracene, arsenic, and lead. Contamination is primarily found at the western end of the Site. Union Tank Car developed and conducted a Remedial Investigation pursuant to the consensual DFFOs signed December 5, 2007, by Ohio EPA and Union Tank Car Company to investigate the Site.

Areas of Concern were originally identified in the Pre-Investigation Evaluation Report and are summarized in the RI report and approved FS. The RI further identified COCs in soil and ground water exceeding Remedial Goals (RG) (See Table 2) and were grouped into exposure units (EU) identified as the Operational Area located in the northern and eastern portion of the Site, the Inactive Area in the western and southern portions of the Site, and a Site-wide EU, encompassing both the Inactive Area and the Operational Area. The areas of concern (AOC), primarily historical features associated with the Erie and Erie-Lackawanna ownership and operations, were originally identified in the Pre-Investigation Evaluation Report are summarized in the FS, as follows:

- *AOC 1 – Former Large Diesel Fuel Aboveground Storage Tanks (AST)*
  The Site operated two large diesel fuel ASTs (1,018,000-gallon and 840,000-gallon capacities) from before 1962 but they were removed before Union Tank Car acquired the Site in 1982. Both tanks were located inside earthen berms, and aboveground lines led to a pump house (AOC 10) and the locomotive service platforms (AOC 2).

- *AOC 2 – Former Locomotive Service Platforms*
  Two former locomotive service platforms were used for refueling locomotives. One of the service platforms dates to at least 1930. Both service platforms were removed from service by the early 1960s.

- *AOC 3 – Former 25,000-gal Diesel Fuel ASTs*
  Four former 25,000-gallon diesel fuel ASTs were located in a walled enclosure. By 1962, two of the four tanks had been removed. By 1980, the remaining two tanks had been removed. Aboveground fuel lines ran from the ASTs to the locomotive service platforms (AOC 2).

- *AOC 4 and 4A –Locomotive Repair Shop and Former Oil/Water Separator*
  The original locomotive repair shop dates to at least 1930. Building construction projects have been conducted to expand the building to its current footprint. A

former oil/water separator was located adjacent to the northwest corner of the shop building (AOC 4A). Metal degreasing, cutting, and grinding comprise current and historical shop operations. Petroleum hydrocarbon compounds associated with new and used oils, degreasing solvents, antifreeze, and diesel fuel were most likely used.

- *AOC 5 – Former Roundhouse and Machine Shop*
  A 35-stall roundhouse formerly operated at the Site and was demolished prior to the late-1970s. The roundhouse was used to park and switch the locomotive engines.

- *AOC 6 – B Yard Repair Facility*
  The B Yard is an area of tracks including up to 18 spurs running east-west across the west-central portion of the Site. A railcar repair facility was present along the southern edge of B Yard, and two vertical diesel ASTs may have existed at the west end of the yard. A 1,000-gal heating oil underground storage tank (UST) was present on the south side of a one-story block building that contained offices, a locker room and washroom, an air brake room, and the mill and forge shop.

- *AOC 7 – Former Oil Reclamation Room*
  The former oil reclamation room was constructed circa 1962 and is located below grade on the east end of the current shop building. Two sumps and three former AST saddles were observed in the room, which are believed to have been used for transferring and storing the oil from the locomotives during repair work.

- *AOC 8 and 8A– Former Wet/Stained Areas and Former Biopond*
  Review of a circa-1960 aerial photograph shows darker areas south of the cleaning racks. These dark areas could indicate wet soil or a potential release. Additionally, by 1981, a cement-lined biopond was constructed within the area (AOC 8A). The biopond was removed in 2006.

- *AOC 9 – Former Potential Parts Cleaning Room*
  A room located on the east end of the current shop building was constructed circa 1962. Union Tank Car employees have no records regarding the specific use of the room; however, the remaining infrastructure in the room suggests it may have potentially been used for parts cleaning.

- *AOC 10 – Former Diesel Unloading Area and Pump House*
  A 1962 construction map of the Site indicates a former pump house and diesel unloading area immediately northeast of the former large ASTs (AOC 1).

- *AOC 11 and 11A – Former Drying Beds and Potential Former Oil/Water Separator*
  Historically, storm water collected from the Site was directed to the storm water pond (AOC 15) prior to treatment in a storm water oil removal system. The treatment residues from this system were then deposited in adjacent depressions called the drying beds (AOC 11). The treated storm water was discharged through

an NPDES permitted discharge point until early 1977 when the treated storm water started being discharged to the City of Marion Wastewater Treatment Plant (WWTP) and the NPDES permit was revoked. Union Tank Car never used the sand drying beds. Between 1990 and 1995, the former drying beds were filled with sand. A potential oil/water separator may have been located east of the former drying beds (AOC 11A).

- *AOC 12 – Former Small ASTs (West End of Site)*
  Based on photographs taken in the 1960s and/or 1970s, a small building with at least two ASTs was located at the west end of the property grounds. It is not known what was stored in the two ASTs or what the building was used for. In addition, black staining around the railroad tracks was observed in this area.

- *AOC 13 – Former Roundhouse ASTs*
  In the 1962 construction drawing, four "oil" ASTs are shown east of the roundhouse. The type of oil stored in the ASTs is unknown.

- *AOC 14 – Current Tank Car Cleaning Racks*
  The current cleaning rack facility is in the central portion of the Site (AOC 14). These high-pressure wash racks use a combination of steam, soap, and water to clean the tank cars prior to performing inspections and repairs.

- *AOC 15 – Current Storm Water Retention Pond*
  Storm water on the eastern portion of the Site is collected by the on-Site storm sewers, diverted to the on-Site retention basin (AOC 15) and discharged to the local publicly operated treatment works (POTW).

- *AOC 16 – Former Lead-Contaminated Area*
  In 1996, Union Tank Car removed 899 cubic yards of lead-contaminated soil from the Site. Post excavation confirmation samples were collected to ensure that the remaining soil did not contain more than 400 milligrams per kilograms (mg/kg) lead. Perimeter samples were also collected outside the excavation and screened using XRF.

- *AOC 17 – Former Power House*
  A former power house was identified on an early construction map for the site. Limited information is known about this facility, but it is assumed to have contained one or more boilers, as well as power transformers.

- *AOC 18 – MW-6 Area*
  During Site investigations conducted in 2011, trichloroethylene (TCE) was detected in samples collected from monitoring well MW-6. No known releases or historical operations have been conducted in this area of the Site.

- *AOC 19 – Blast Sand Piles*
  Spent sand blast material, used to sand-blast clean tank cars to prepare them for painting, was stockpiled on-Site in AOC 19.

- *AOC 20 – Transformers*
  Two pole-mounted transformers were removed from the Site in 2010. Twenty-two transformers remain at the facility.

- *AOC 21 – Northwest Pullback Soils*
  During reconstruction of the Northwest Pullback rail line, disturbed soils from the rail bed were temporarily stockpiled along the south side of the track, and then graded back and used in the construction of the current Northwest Pullback rail bed.

- *AOC 22 – Warehouse*
  The warehouse building located along the northern property line was formerly owned and operated by Quaker Oats as a storage and loading facility for pet food. Union Tank Car bought the building in the mid-1980s.

- Several plumes of ground water contaminated with VOCs (Plumes 1-5), SVOCs and LNAPL and exceeding PRGs were identified during the RI (Figure 3). The plumes of contaminants are found in the TBI ground water unit extending down to approximately 20 feet below ground surface. Contaminants may migrate downward into Shallow Bedrock, but no COCs have been consistently found in the Shallow Bedrock.

2.2 Summary of Site Risks

A BHHRA was conducted as part of the RI. The United States Environmental Protection Agency RI/FS Guidance manual defines a BHHRA as an evaluation of the current and potential future risks to human receptors as a result of exposure to contaminants at the Site. To estimate risk, a four-step process is undertaken that involves data collection and evaluation, assessment of potential exposure, assessment of the contamination toxicity, and characterization of the risk. The BHHRA also provides the basis for the Ohio EPA to determine whether remedial action is necessary at the Site. Based on the BHHRA, Ohio EPA has determined that remedial action is necessary at this Site and has prepared this Preferred Plan describing the remedial action proposed by Ohio EPA for the Site.

2.2.2 Human Health Risks

The BHHRA evaluated potential impacts to human health posed by contaminants in soil, ground water, and indoor air for the following exposure pathways: hypothetical residents, construction workers, and outdoor industrial workers. Additional information on specific COCs is available from the Agency for Toxic Substances and Disease Registry (ATSDR Toxicological Profiles)

The acceptable risk goal for human health is an excess lifetime cancer risk of $1x10^{-5}$ (*i.e.*, 1 in 100,000) and a hazard quotient (HQ) or hazard index (HI) of 1. See the DERR Technical Decision Compendium (TDC): "Human Health Cumulative Carcinogenic Risk and Non-carcinogenic Hazard Goals for DERR Remedial Response and Federal Facility Oversight" dated August 2009:

https://epa.ohio.gov/static/Portals/30/rules/HH+Cumulative+Carc+Risk+and+Non-Carc+Hazard+Goals.pdf

The BHHRA (Roux 2019) documented risk above acceptable levels. At the direction of Ohio EPA, the assessment of risk was further refined in the Feasibility Study (Roux 2021) using an Exposure Unit (EU) approach which indicated that risk thresholds are exceeded for the following EUs and exposure scenarios:

- Resident – all EUs
- Construction worker – North VOC Soil Area, South VOC Soil Area, Cleaning Rack
- Outdoor industrial worker – North VOC Soil Area, South VOC Soil Area

Primarily from VOCs and SVOCs in the soil, ground water, and indoor air (Table 2). There were no exceedances of the risk goals for the Off-Site Resident.

2.2.3 Ecological Risks

An Ecological Risk Assessment (ERA) was not necessary because important ecological receptors that could be affected by Site contamination were not identified.

3.0 REMEDIAL ACTION OBJECTIVES AND REMEDIAL LEVELS

Remedial Action Objectives (RAOs) were developed for the Site to identify goals that a remedy should achieve to ensure protection of human health and the environment. The RAOs for the Site are listed in Table 1, below:

For human health, the RAOs are based on applicable regulations such as the drinking water MCLs and/or the human health risk goals.

TABLE 1: REMEDIAL ACTION OBJECTIVES	
Soil	
Human Health Risk	Prevent direct human exposure to soil (ingestion, inhalation, and dermal contact) that would produce a cumulative excess lifetime cancer risk (ELCR) greater than 1E-05 and/or a HQ or HI greater than 1.
Human Health Risk	Prevent the leaching of contaminated soil to ground water underneath the Site in excess of the MCLs for public drinking water or acceptable cumulative risk levels.
Ground Water	

TABLE 1: REMEDIAL ACTION OBJECTIVES	
Human Health Risk	Prevent direct human exposure of ground water aquifers at the Site or from off-site aquifer areas impacted by contaminant migration from the Site that would produce a cumulative ELCR of 1E-05 and/or a cumulative non-cancer HI of 1: • Return ground water to its beneficial use where practicable within a reasonable timeframe. • Prevent exposure to ground water at the Site or from off-site aquifer areas impacted by contaminant migration from the Site containing COCs above acceptable risk levels or MCLs. • Prevent site related contaminants from migrating off the Site property above acceptable risk levels or MCLs.
Ground Water: LNAPL-related	
Human Health Risk	Prevent direct human contact with any hazardous substances contained in LNAPL for all potential receptors at the Site.
Human Health Risk	Prevent further release of dissolved LNAPL as a source of soil and ground water contamination at the Site property above acceptable risk levels or MCLs.
Indoor Air	
Human Health Risk	Prevent vapor intrusion from contaminated media to indoor air that would produce a cumulative ELCR of 1E-05 and/or a cumulative non-cancer HI of 1: • Prevent inhalation of indoor air containing unacceptable levels of contaminants due to vapor intrusion from contaminated media to current buildings. • Prevent inhalation of indoor air containing unacceptable levels of contaminants due to vapor intrusion from contaminated media to future constructed buildings.

In the process of scoping and conducting the RI and FS, generic PRGs were established to help achieve the RAOs and protect human health and the environment. These PRGs were converted to site-specific remediation goals (RGs) following completion of the RI and FS phase of the project to establish remediation levels (RLs). The RLs for the primary COCs at the Site and basis are listed below.

TABLE 2: CONTAMINANTS OF CONCERN (COCs) / REMEDIATION LEVELS (RLs)

Medium	COC	RL	RL Basis
Soils: Human Direct Contact	Trichloroethylene	21 ppm industrial / 3.1 ppm construction	USEPA 2018 Regional Screening Level (RSL) / Site specific risk based
	Vinyl Chloride	19 ppm industrial / 61 ppm construction	USEPA 2018 RSL / Site specific risk based
	Benzo(a)anthracene	230 ppm industrial	USEPA 2018 RSL
	Benzo(a)pyrene	23 ppm industrial / 38 ppm construction	USEPA 2018 RSL / Site specific risk based
	Dibenzo(a, h)anthracene	23 ppm industrial	USEPA 2018 RSL

TABLE 2: CONTAMINANTS OF CONCERN (COCs) / REMEDIATION LEVELS (RLs)			
Medium	**COC**	**RL**	**RL Basis**
	Arsenic	33 ppm industrial / 120 ppm construction	USEPA 2018 RSL / Site specific risk based
	Manganese	1,500 ppm construction	Site specific risk based
Soils: Leaching to Ground Water (till)	Benzene	0.004 ppm	Site specific modeling
	1,1-Dichloroethane	0.01 ppm	
	Cis-1,2-Dichloroethene	0.03 ppm	
	Ethylbenzene	1.2 ppm	
	Trichloroethylene	0.003 ppm	
	Vinyl Chloride	0.0009 ppm	
	Anthracene	93 ppm	
	Benzo(a)anthracene	0.2 ppm	
	Benzo(b)fluoranthene	4.8 ppm	
	Benzo(a)pyrene	0.4 ppm	
	Bis(2-ethylhexyl) phthalate	2.3 ppm	
	Dibenzo(a, h)anthracene	1.5 ppm	
	1,4-Dioxane	0.001 ppm	
	Indeno (1,2,3-cd) pyrene	16 ppm	
	1-Methylnaphthalene	0.09 ppm	
	2-Methylnaphthalene	0.3 ppm	
	Naphthalene	0.13 ppm	
Ground Water: Potable	Benzene	5 ppb	USEPA MCL
	1,1-Dichloroethane	28 ppb	USEPA 2018 RSL
	Cis-1,2-Dichloroethene	70 ppb	USEPA MCL
	Ethylbenzene	700 ppb	USEPA MCL
	Trichloroethylene	5 ppb	USEPA MCL
	Vinyl Chloride	2 ppb	USEPA MCL
	Anthracene	1,800 ppb	USEPA 2018 RSL
	Benzo(a)anthracene	0.3 ppb	USEPA 2018 RSL
	Benzo(b)fluoranthene	2.5 ppb	USEPA 2018 RSL
	Benzo(a)pyrene	0.2 ppb	USEPA MCL
	Bis(2-ethylhexyl) phthalate	6 ppb	USEPA MCL
	Dibenzo(a, h)anthracene	0.3 ppb	USEPA 2018 RSL
	1,4-Dioxane	4.6 ppb	USEPA 2018 RSL
	Indeno (1,2,3-cd) pyrene	2.5 ppb	USEPA 2018 RSL
	1-Methylnaphthalene	11 ppb	USEPA 2018 RSL
	2-Methylnaphthalene	36 ppb	USEPA 2018 RSL
	Naphthalene	1.7 ppb	USEPA 2018 RSL
Indoor Air: Human Direct Contact (Inhalation)	Benzene	16 $\mu g/m^3$	USEPA 2018 RSL
	Chloroform	5.3 $\mu g/m^3$	USEPA 2018 RSL
	1,1-Dichloroethane	77 $\mu g/m^3$	USEPA 2018 RSL
	Ethylbenzene	49 $\mu g/m^3$	USEPA 2018 RSL
	Trichloroethylene	8.8 $\mu g/m^3$	USEPA 2018 RSL
	Vinyl chloride	28 $\mu g/m^3$	USEPA 2018 RSL
	Naphthalene	3.6 $\mu g/m^3$	USEPA 2018 RSL

4.0 SUMMARY OF REMEDIAL ALTERNATIVES

A total of six (6) remedial alternatives were considered in the FS to help achieve the RAOs and RLs. A brief description of the major features of each remedial alternative is provided in Table 3: Summary of Site Remedial Alternatives.

TABLE 3: SUMMARY OF SITE REMEDIAL ALTERNATIVES		
Media	**Alternative**	**Description of Remedial Alternative**
Soil		
	S1	No action
	S2	**RMP** - LNAPL, Cleaning Rack, North VOC Soil Area, South VOC Soil Area **Pavement cap** - North VOC Soil Area, South VOC Soil Area **MNA** - Soil Migration to Ground water (SMTG) Only Exceedances Within Contaminant Specific Ground Water Plumes (VOCs and Polycyclic aromatic hydrocarbons (PAHs))
	S3	**RMP -** LNAPL, Cleaning Rack **In-situ chemical/biological treatment** - North VOC Soil Area, South VOC Soil Area **MNA -** SMTG Only Exceedances Within Contaminant Specific Ground Water Plumes (VOCs and PAHs)
	S4	**RMP -** LNAPL, Cleaning Rack **Hot spot excavation** - North VOC Soil Area **In-situ chemical/biological treatment** - South VOC Soil Area **MNA** - SMTG Only Exceedances Within Contaminant Specific Ground Water Plumes (VOCs and PAHs)
	S5	**RMP -** LNAPL **Hot spot excavation** - Cleaning Rack **In-situ Thermal treatment** - North VOC Soil Area, South VOC Soil Area **MNA -** SMTG Only Exceedances Within Contaminant Specific Ground Water Plumes (VOCs and PAHs)
Ground water		
	G1	No Action
	G2	**Ground water pump and treat -** Ground water VOC Plumes 1 through 5 **LNAPL Collection/NSZD/MNA -** LNAPL and associated Ground water PAH Plume
	G3	**In-situ chemical/biological treatment -** Ground water VOC Plumes 1 through 5 **LNAPL Collection/NSZD/MNA -** LNAPL and associated PAH Ground water Plume
	G4 (G5 in the FS)	**In-situ chemical/biological treatment -** Ground water VOC Plumes 1, 2, 4 and 5 **LNAPL Collection/Enhancements/NSZD/MNA -** LNAPL and associated PAH Ground water Plume **In-situ thermal treatment** - Ground water VOC Plume 3
Indoor Air		
	IA1	No Action
	IA2	**Indoor air/ sub slab monitoring** - Repair Shop and Maintenance Building. **Active SSDS and sealing building cracks** - Contingency mitigation measures if indoor air monitoring results exceed the indoor air PRGs.

TABLE 3: SUMMARY OF SITE REMEDIAL ALTERNATIVES		
Media	**Alternative**	**Description of Remedial Alternative**
		Soil excavation/disposal - Final Remedy for sub slab soil gas Vapor Intrusion Screening Level (VISL) exceedances present upon the demolition of the Repair Shop and Maintenance Building. **Vapor barrier cap and passive SSDS** - New buildings built on top of soil gas or ground water VISL exceedances. **Ground Water Remedy** - Removal of Ground water VISL exceedances
	IA3 (IA3A in the FS)	Identical to IA2 except SVE is the final remedy for sub slab soil gas VISL exceedances at the Repair Shop and Maintenance Building (IA4 and IA5)
	IA4	**In-situ soil vapor extraction** - Final remedy for sub slab soil gas VISL exceedances present beneath the Maintenance Building and Repair Shop Basement. **Vapor barrier cap and passive SSDS** - New buildings built on top of soil gas or ground water VISL exceedances. **Ground Water Remedy** - Removal of Ground water VISL exceedances

4.1 No Action Alternatives (S1, G1, IA1)

The “no action alternatives” are required by the NCP to establish a baseline for the comparison of other remedial alternatives for soil, ground water or indoor air. These alternatives have been included in a single section for efficiency. Under these alternatives, no remedial activities or monitoring to prevent exposure to contaminated media would be conducted at the Site.

4.2 Soil Alternatives

The first soil alternative is no action and serves as a basis of comparison to other ground water alternatives.

Alternative 2 Soil: Exceedances within contaminant specific ground water plumes (VOCs and PAHs) relating only to SMTG would be addressed using MNA. A pavement cap would be used to cover soil in the North VOC Soil Area and the South VOC Soil Area. Construction worker protection in the form of a RMP would be implemented to address soils within the Cleaning Rack Area, North VOC Soil Area, and South VOC Soil Area. An environmental covenant would be used to maintain the Site for industrial use only. Soil related pre-design investigation (PDI) activities considered include primary soil source investigation at VOC Plume 1 if increasing concentrations at MW-74R become a trend.

Alternative 3 Soil: Exceedances within contaminant specific ground water plumes (VOCs and SVOCs) relating only to SMTG would be addressed the same as Alternative 2 using MNA. Construction worker protection in the form of a RMP would be implemented to address soils within the Cleaning Rack Area. An environmental covenant would be used to maintain the Site for industrial use only. The North and South VOC Soil Areas would be treated in-situ concurrent with ground water VOC Plume 2 and 3 using in-situ chemical/biological treatment described above. Soil related PDI activities considered include pilot scale in-situ chemical/biological remediation for the South VOC Soil Area and primary soil source investigation at VOC Plume 1 if increasing concentrations at MW-74R become a trend.

Alternative 4 Soil: Exceedances within contaminant specific ground water plumes (VOCs and SVOCs) relating only to SMTG would be addressed the same as Alternatives 2 and 3 using MNA. Construction worker protection in the form of a RMP would be implemented to address soils within the Cleaning Rack Area. An environmental covenant would be used to maintain the Site for industrial use only.

The North VOC Soil Area would be excavated and shipped off-site for disposal as hazardous waste. The South VOC Soil Area would be treated in-situ concurrent with ground water VOC Plume 2 using in-situ chemical/biological treatment described above. Soil related PDI activities considered include pilot scale in-situ chemical/biological remediation for the South VOC Soil Area, toxicity characteristic leaching procedure (TCLP) and total VOC soil sampling in the North VOC soil areas for waste characterization and disposal cost purposes and primary soil source investigation at Plume 1 if increasing concentrations at MW-74R become a trend.

Alternative 5 Soil: Exceedances within contaminant specific ground water plumes (VOCs and SVOCs) relating only to SMTG would be addressed the same as Alternatives 2, 3 and 4 using MNA. An environmental covenant would be used to maintain the Site for industrial use only. Cleaning Rack (construction worker exposure) soils would be excavated and shipped off-site for disposal.

The North VOC Soil Area is co-located with VOC Plume 3 and would be addressed using thermal treatment as described above for VOC Plume 3. Similarly, the South VOC Soil Area would be treated using thermal treatment with a treatment period of approximately 4.5-6.5 months. Soil related PDI activities considered include primary soil source investigation at Plume 1 if increasing concentrations at MW-74R become a trend.

4.3 Ground Water Alternatives

As previously mentioned, the first ground water alternative is no action and serves as a basis of comparison to other ground water alternatives.

Alternative 2 Ground Water: Ground water within VOC Plumes 1 through 5 would be extracted using a system of nine submersible ground water extraction pumps and conveyed to the on-Site WWTP for treatment and subsequently discharged to the local POTW. The ground water pump and treatment system would be expected to operate for approximately 15 years. Mobile LNAPL would be extracted at four of the nine wells using a dual pump liquid extraction system (which would include two submersible pumps for ground water and LNAPL extraction) for approximately three years. The conceptual LNAPL remedial design would also include the potential installation of LNAPL skimmers in an additional five wells for LNAPL recovery. Absorbent socks would be deployed in wells to passively recover LNAPL after it is demonstrated that active recovery is no longer effective. NSZD would then be implemented to address residual LNAPL. LNAPL is a source of dissolved phase PAHs in ground water; therefore, MNA would be used to address the associated ground water containing PAHs. Ground water monitoring and soil gas monitoring would be conducted. Construction worker protection in the form of a RMP would be implemented for LNAPL as well as ground water use restrictions while ground water PRG exceedances exist. Ground water related PDI activities considered include additional ground water/LNAPL modeling, laser-induced fluorescence (LIF) LNAPL investigation, installation of absorbent materials in wells to evaluate the ability of different materials to collect LNAPL, additional ground water well installation or ground water grab sampling for the VOC plumes, additional site-wide ground water sampling for VOCs, PAHs, and/or 1,4-dioxane, LNAPL transmissivity testing, and aquifer pump testing.

Alternative 3 Ground Water: Ground water VOC Plumes 1 through 5 would be addressed with in-situ chemical/biological treatment over a treatment and monitoring period of approximately 10 years. The conceptual design includes the potential extraction of mobile LNAPL using a nine well, multi-phase extraction (MPE) system for approximately three years in areas where active LNAPL recovery is determined to be technically practicable. Ground water extracted from the MPE wells would be conveyed to the on-Site WWTP for treatment and subsequently discharged to the local POTW. Absorbent socks would be deployed in wells to passively recover LNAPL after it is demonstrated that active recovery is no longer effective. NSZD would then be implemented to address residual LNAPL. LNAPL is a source of dissolved phase PAHs in groundwater; therefore, MNA would be used to address the associated ground water containing PAHs. Ground water monitoring and soil gas monitoring would be conducted. Construction worker protection in the form of a RMP would be implemented for LNAPL as well as ground water use restrictions while ground water PRG exceedances exist. Ground water related PDI activities considered include additional ground water/LNAPL modeling, LIF LNAPL investigation, installation of absorbent materials in wells to evaluate the ability of different materials to collect residual LNAPL, additional ground water well installation or ground water grab sampling for the VOC plumes, additional Site-wide ground water sampling for VOCs, PAHs, and/or 1,4-dioxane, pilot scale in-situ chemical/biological remediation for a lower concentration and a higher concentration VOC plume area, LNAPL transmissivity testing, and an MPE pilot scale test.

Alternative 4 Ground Water (Alternative G5 in the FS): Ground water Plume 3 would be addressed using in-situ thermal treatment with a treatment period of approximately 4-5 months. The conceptual LNAPL remedial design would include a seven well MPE system plus the injection of surfactant to enhance LNAPL recovery and would be operated for approximately three years. Active LNAPL recovery would take place in areas where LNAPL recovery is determined to be technically practicable. Absorbent socks would be deployed in wells to passively recover LNAPL after it is demonstrated that active recovery is no longer effective. NSZD would then be implemented to address residual LNAPL. LNAPL is a source of dissolved phase PAHs in ground water; therefore, MNA would be used to address the associated ground water containing PAHs. Ground water monitoring and soil gas monitoring would be conducted. Construction worker protection in the form of a RMP would be implemented for LNAPL as well as ground water use restrictions while ground water PRG exceedances exist. Ground water Plumes 1, 2, 4 and 5 will be addressed in the same way as Alternatives 3 and 4 with a treatment and monitoring period of approximately 10 years. Ground water related PDI activities are the same as those considered for Alternatives 3 and 4.

4.4 Indoor Air Alternatives

As previously mentioned, the first indoor air alternative is no action and serves as a basis of comparison to other surface water alternatives.

Alternative 2 Indoor Air: Indoor air/sub slab soil gas in the Repair Building and the Maintenance Building would be sampled annually for the first 5 years and every five years thereafter, with the concrete floors and building ventilation system inspected annually. The monitoring frequency would be re-evaluated in the Five-Year Review. New buildings constructed at locations with soil gas or ground water VISL exceedances would have vapor barriers and passive sub slab depressurization to mitigate the potential for vapor intrusion.

If indoor air monitoring identified PRG exceedances due to VI inside the Repair Shop and/or Maintenance Building, contingency vapor intrusion mitigation would be implemented including sealing cracks in the building floor and the installation of active SSDSs.

If the Repair Shop and Maintenance buildings are demolished in the future and soil gas VISL exceedances still exist, soil excavation and disposal would be used as a final remedy to remove the soil with soil gas VISL exceedances. Ground water VISL exceedances would be addressed through the ground water remedial response.

Indoor Air Alternative 3 (Alternative 3A in the FS): Sub slab soil gas VISL exceedances underneath the Repair Shop and Maintenance Building will be addressed the same as Alternative 4 using SVE with sub slab soil gas monitoring as a final remedy for a duration of 3 years. New construction vapor barrier and mitigation restrictions will be addressed in the same way as Alternatives 2, 3, 4 and 5. Ground water VISL exceedances would be addressed through the ground water remedial response. Indoor air related PDI activities are the same as those considered for Alternative 4.

The performance standard is met when Site ground water and soil vapor meet RLs referenced in RAOs that are protective of the vapor intrusion pathway, or if an institutional or engineering control is the selected remedial option, or if exposure pathways are eliminated.

Alternative 4 Indoor Air: Sub slab soil gas VISL exceedances underneath the Repair Shop and Maintenance Building will be addressed using SVE with sub slab soil gas monitoring as a final remedy for a duration of 3 years. New construction vapor barrier and mitigation restrictions will be addressed in the same way as Alternatives 2 and 3. Ground water VISL exceedances would be addressed through the ground water remedial response. Indoor air related PDI activities considered are SVE system diagnostic evaluations for the proposed installation areas.

Alternative 5 Indoor Air: Sub slab soil gas VISL exceedances underneath the Repair Shop and Maintenance Building will be addressed the same as Alternative 4 using SVE with sub slab soil gas monitoring as a final remedy for a duration of 3 years. New construction vapor barrier and mitigation restrictions will be addressed in the same way as Alternatives 2, 3 and 4. Ground water VISL exceedances would be addressed through the ground water remedial response. Indoor air related PDI activities are the same as those considered for Alternative 4.

4.5 Common Elements Between Alternatives

There are five common elements between the compiled alternatives, excluding the no action alternative. These common elements are described below:

1. **Institutional Controls (Soil, Ground Water and Indoor Air)** – Institutional controls common to all alternatives will be included in an environmental covenant for soil, ground water and indoor air. The Site is currently used for industrial purposes and zoned by the City of Marion as industrial. The Site is expected to continue use as an industrial facility; therefore, the industrial soil and indoor air PRGs are considered the most appropriate standard for remedial alternatives. The Site will be restricted to commercial and industrial land uses through an environmental covenant. Use of the Outdoor Industrial Worker soil and indoor air PRGs, where applicable, requires a land use restriction to be recorded in an environmental covenant. A ground water use restriction will also be required to help address SMTG PRG exceedances and ground water PRG exceedances while they exist. Construction worker protection in the form of a RMP will be implemented for construction worker exposure to LNAPL while LNAPL exists. The RMP will detail the exposure risks and actions necessary to limit exposure. A building occupancy restriction requiring new buildings to have appropriate engineering controls to prevent vapor intrusion and/or monitoring to evaluate the risk of vapor intrusion is considered for each remedial alternative.

2. **Long-Term Ground Water Monitoring** – Long-term ground water performance monitoring is included for each alternative to evaluate the long-term effectiveness of the chosen remedy. Ground water monitoring results over time will be evaluated for trend and stability as well as compliance with the RAOs.

3. **LNAPL/Ground Water Mixture Ex-Situ Treatment (if necessary)** – Extracted LNAPL/ground water mixtures may require some level of treatment or separation. LNAPL free product will be disposed of off-Site using a liquid waste disposal/management contractor and separated/treated ground water will be sent to the on-Site WWTP or discharged to the local POTW based on the effluent treated concentration of the applicable contaminants.

4. **NSZD/MNA for LNAPL-PAH Ground Water Plume** – NSZD is the final step in the remediation of residual LNAPL after physical recovery methods have reached their technological limits. MNA is a proven method to address PAHs in ground water and was found to be the best suited treatment process to address a PAH ground water plume of the size and distribution found at the UTC Site.

5. **New Building VI Mitigation** – New buildings constructed at locations with soil gas or ground water VISL exceedances will consider a vapor barrier and passive depressurization system to mitigate the potential for vapor intrusion and require Ohio EPA approval prior to occupancy.

5.0 COMPARISON AND EVALUATION OF ALTERNATIVES

5.1 Criteria

The eight (8) criteria listed in Table 4 below are used to evaluate the various remedial alternatives individually and compare them with each other to select the preferred remedy. Criteria 1 and 2 are threshold criteria required for acceptance of an alternative. Any acceptable remedy must comply with both these criteria. Evaluation Criteria number 3 through number 7 are the balancing criteria used to select the best remedial alternative(s) identified in the Preferred Plan. Evaluation Criteria number 8, community acceptance, is evaluated through public comment received during the comment period.

TABLE 4 REMEDIAL ALTERNATIVE EVALUATION CRITERIA
Threshold Criteria (2)
Overall Protection of Public Health and the Environment – determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, treatment, etc.
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) – evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
Balancing Criteria (5)
Long-Term Effectiveness and Permanence – evaluates the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment – evaluates the amount of contamination present, the ability of the contamination to move in the environment, and the use of treatment to reduce harmful effects of the principal contaminants.
Short-Term Effectiveness – evaluates the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

TABLE 4 REMEDIAL ALTERNATIVE EVALUATION CRITERIA
Implementability – evaluates the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost – includes estimated capital and annual operation and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
Modifying Criterion (1)
Community Acceptance – considers whether the local community agrees with Ohio EPA's analyses and preferred alternative. Comments received on the Preferred Plan are an important indicator of community acceptance.

5.2 Evaluation of Alternatives

A summary of the results of the evaluation of the Site remedial alternatives and the costs associated with each alternative is included below in **Table 5: Evaluation of Site Remedial Alternatives**. Community Acceptance will be evaluated after the end of comment period.

TABLE 5: EVALUATION OF SITE REMEDIAL ALTERNATIVES								
Remedial Alternatives	**Threshold Criteria**		**Balancing Criteria**					**Modifying Criteria**
	1. Protects Human Health & Environment	2. Compliance with ARARs	3. Long Term Effectiveness	4. Reduces T, M and/or V by Treatment	5. Short Term Effectiveness	6. Implementable	7. Costs	8. Community Acceptance
Soil								
S1	□	□	□	□	□	□	□	
S2	■	■	■	■	■	■	■	
S3	■	■	■	■	■	■	■	
S4	■	■	■	■	■	■	■	
S5	■	■	■	■	■	■	■	
Ground water								
G1	□	□	□	□	□	□	□	
G2	■	■	■	■	■	■	■	
G3	■	■	■	■	■	■	■	
G4 (G5 in FS)	■	■	■	■	■	■	■	

TABLE 5: EVALUATION OF SITE REMEDIAL ALTERNATIVES								
Remedial Alternatives	Threshold Criteria		Balancing Criteria					Modifying Criteria
	1. Protects Human Health & Environment	2. Compliance with ARARs	3. Long Term Effectiveness	4. Reduces T, M and/or V by Treatment	5. Short Term Effectiveness	6. Implementable	7. Costs	8. Community Acceptance
Indoor Air								
IA1	□	□	□	□	□	□	□	
IA2	■	■	■	■	■	■	■	
IA3 (IA3A in FS)	■	■	■	■	■	■	■	
IA4	■	■	■	■	■	■	■	
IA5	■	■	■	■	■	■	■	

■ = Fully Meets Criteria ◘ = Partially Meets Criteria □ = Does Not Meet Criteria

6.0 PREFERRED REMEDIAL ALTERNATIVE

Ohio EPA's preferred remedial alternative for the Union Tank Car Site is Alternative 4 (Alternative 3A in the FS) which is a combination of Soil Alternative S3: RMP, In-situ chemical/biological treatment, and MNA; Ground Water Alternative G3, In-situ chemical/biological treatment, LNAPL Collection/NSZD/MNA; and Indoor Air Alternative IA3 (IA3A in the FS), Indoor air/ sub slab monitoring, Active SSDS and sealing building cracks, SVE, Vapor barrier cap and passive SSDS.

Based on information presently available, the preferred remedial alternative best satisfies the criteria defined in Table 6: Evaluation of Site Remedial Alternatives. Specifically, Alternative 4 (S3, G3, and IA3 (IA3A in the FS)) best satisfies the balancing criteria for the reduction of toxicity, mobility, or volume through treatment for the indoor air source area without significantly more cost. The elements of the preferred remedial alternative are summarized below:

6.1 Soil Remedial Alternative (S3)

Soil Remedial Alternative 3 includes a RMP for LNAPL and Cleaning Rack area; In-situ chemical/biological treatment for the North VOC Soil Area and South VOC Soil Area, and MNA for SMTG only exceedances within contaminant specific ground water plumes (VOCs and PAHs).

The performance standard is met when soil meets acceptable levels referenced in RAOs, or if an institutional control or engineering control is the selected remedial option, exposure pathways are eliminated until institutional controls or engineering controls are no longer necessary.

6.2 Ground Water Remedial Alternative (G3)

Ground water Alternative 3 includes In-situ chemical/biological treatment for Ground water VOC Plumes 1 through 5, LNAPL Collection/NSZD/MNA for LNAPL and associated PAH Ground water Plume.

The performance standard is met when: (1) ground water meets acceptable RLs referenced in RAOs that are protective of the ground water exposure pathway, or if an institutional or engineering control is the selected remedial option, exposure pathways are eliminated until institutional controls or engineering controls are no longer necessary (2) ground water is returned to beneficial use if determined practicable and within a reasonable timeframe, (3) LNAPL is removed or exposure pathways eliminated.

6.3 Indoor Air Remedial Alternative (IA3)

Indoor Air Alternative 3 (Alternative IA3A in the FS) is identical to IA2 except SVE is the final remedy for sub slab soil gas VISL exceedances at the Repair Shop and Maintenance Building. The performance standard is met when Site ground water and soil vapor meet RLs referenced in RAOs that are protective of the vapor intrusion pathway, or if an institutional or engineering control is the selected remedial option, or if exposure pathways are eliminated.

7.0 COMMUNITY PARTICIPATION

Ohio EPA's preferred remedial alternative may change in response to the Agency's consideration of public comments or new information.

Ohio EPA, therefore, encourages the public to review and comment on this Preferred Plan, and other documents contained in the administrative record file for the Site, to gain a better understanding of the Site, and the remedial activities proposed.

8.0 REFERENCES

Roux Associates, Inc. (Roux). 2019. Revised Remedial Investigation Report, Union Tank Care Site, 939 Holland Road, Marion, Ohio. January.

Roux Associates, Inc. (Roux). 2021. Revised Feasibility Study Report – Revision 2, Union Tank Care Site, 939 Holland Road, Marion, Ohio. July.

Figure 1: Site Location Map

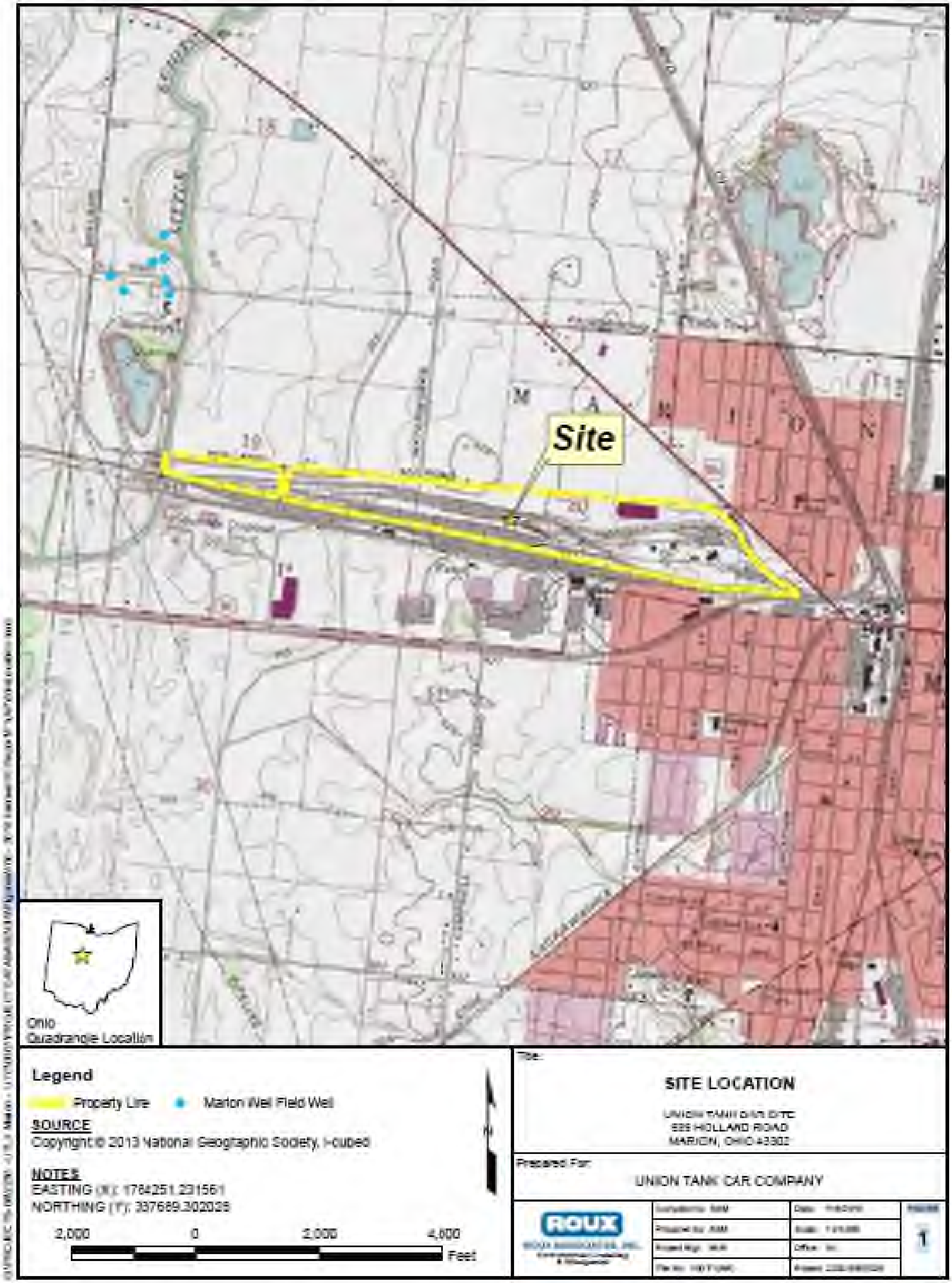

Figure 2: Site Map

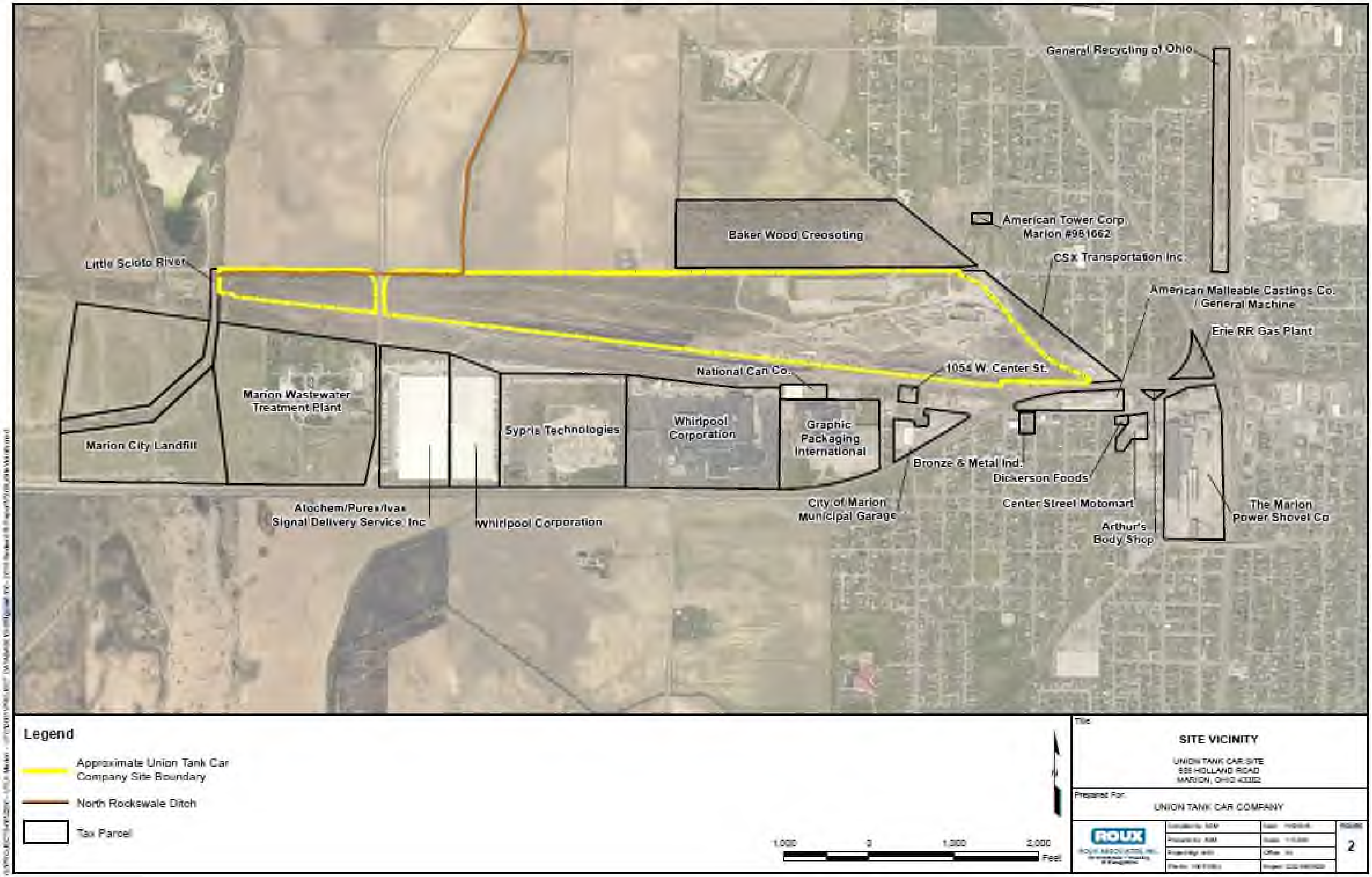

Figure 3: Extent of Ground water, LNAPL, and Soil Gas Exceedances