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**To:** Connor Mulcahy, WDNR; Angie Carey, WDNR; Michele Norman, WDNR; Brian Waite, WDNR; Judy Fassbender, WDNR

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**Cc:** Mike Kellogg, Connell; Julie A Zimdars, Ramboll/Connell; Brian Schneider, Ramboll/Connell; Bruce Keyes, Foley/Connell; Mike Slenska, Beazer; Kurt Paschl, Beazer; Hillary Evanko, Beazer; Brett Philpotts, Beazer; Chip McChesney, Beazer; Larry Haskin, City of Oak Creek; Bill Nelson, Godfrey & Kahn/City of Oak Creek; Art Harrington, Godfrey & Kahn/City of Oak Creek; Scott Tarmann, Ramboll/City of Oak Creek

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**From:** Michael R. Noel, P.G.; James R. Dickson, P.E.; Prosper Gbolo, P.G., Tetra Tech

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**Date:** February 15, 2024

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**Subject:** Status Update Report - Pre-Design Investigation, DNAPL Delineation, Former Koppers Tar Plant and Wabash Alloys Site, Oak Creek, Wisconsin

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## 1.0 INTRODUCTION

This status update report was prepared by Tetra Tech, Inc. (“Tetra Tech”) on behalf of Beazer East, Inc. (“Beazer”) to document and present results of the horizontal and vertical delineation of dense non-aqueous phase liquid (“DNAPL”) completed during the pre-design investigation (“PDI”) at the Former Koppers Tar Plant and Wabash Alloys Site located in the City of Oak Creek, Milwaukee County, Wisconsin, on the western shore of Lake Michigan (“Site”<sup>1</sup>; Figure 1). The work was completed in accordance with the July 2023 Conceptual Remedial Action Plan (“RAP”; Tetra Tech and Ramboll, 2023) conditionally approved by the Wisconsin Department of Natural Resources (“WDNR”) pursuant to letters dated August 16, 2023 and August 30, 2023.

This Status Update Report presents the results of the PDI activities described in Section 2.1 of the RAP and includes revised figures of the delineated horizontal and vertical extent of DNAPL, the PDI Soil Boring Log Information forms and Borehole Abandonment forms for each soil boring, and

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<sup>1</sup> The Former Koppers Tar Plant and Wabash Alloys Site is comprised of two properties: 9100 South Fifth Avenue, Oak Creek, Wisconsin (“Connell Property”) and 9170 South Fifth Avenue, Oak Creek, Wisconsin (“City Utility Corridor” Lot 1). The easternmost 0.5 acre of the Connell Property was conveyed to the City in March 2023 for bluff stabilization purposes.

the photo log of the PDI soil cores. A determination of the specific areas and depths requiring ISS will be presented in the Remedial Design Report (“RDR”) to be submitted at a later date.

### 1.1. Site Conditions

Currently, the Connell Property is vacant and undeveloped, and the perimeter is secured to prevent authorized access. The east side of the Connell Property is vegetated with tall grass (phragmites), shrubs, and trees. The west side is occupied by 6 acres of concrete and exterior flatwork foundation slabs of five demolished contiguous buildings (“foundation pads”) and other physical features that supported former operations (shown in Figure 2). Clean soil is stockpiled northwest of the foundation pads and concrete is stockpiled southwest of the foundation pads. Most of the paved areas and access roads are intact and were used during field activities.

The City Utility Corridor includes a paved access road that extends eastward from Fifth Avenue to the City of Oak Creek water intake facility on Lake Michigan. Subsurface utilities within the corridor are shown on Figure 2 and include:

- The Milwaukee Metropolitan Sewerage District (“MMSD”) Metropolitan Interceptor Sewer (“MIS”), a reinforced concrete pipe with an inside diameter (“ID”) of 48 inches and an outside diameter (“OD”) of 58 inches that runs from north to south through the middle of the Connell Property, turns to the west and runs along the north side of the access road.
- A reinforced concrete pressurized pipe (“RCPP”) raw water main from the water intake facility that runs along the north side of the access road along with three buried high voltage electric lines that feed the lift station. This RCPP raw water main was installed in April 1971 to convey untreated water to the treatment facility. The RCPP raw water main has an ID of 30 inches and an OD of 37 inches. Three high-voltage electric supply lines feed the lift station adjacent to Lake Michigan. These lines run about 40 inches below grade above the RCPP pipe crossing from side to side as it runs downhill.
- A prestressed concrete cylinder pipe (“PCCP”) water main from the water intake facility that runs along the south side of the access road. This PCCP water main was installed in March 2009 to supplement the 30-inch RCPP raw water main. The PCCP has an ID of 36 inches and an OD of 45 inches. Running with the PCCP water main is a 4-inch PVC water supply line installed in the same utility trench.
- A concrete storm sewer runs beneath the access road and discharges to Lake Michigan. This pipe has an ID of 78 inches and an OD of 94.5 inches.
- A subsurface natural gas pipe, lighting electric supply lines, and a fiber optic cable all run along the periphery of the southern PCCP water main.

In addition to the above-described subsurface utility lines in the City Utility Corridor, there is an overhead phone line that is supported by utility poles.

During the PDI, the paved access road within the City Utility Corridor was heavily used by trucks transporting stone blocks for use in the City of Oak Creek bluff stabilization project.

## 1.2. Scope of Work

Per Sections 2.1 and 2.4.3 of the RAP, the content of this status report includes information pertaining to the delineation of the horizontal and vertical extent of DNAPL on the Connell Property and along the two water mains in the City Utility Corridor. Preparation for the DNAPL delineation PDI activities included aerial photography and photogrammetric topographic mapping (RAP Section 2.9) and confirming the depth and location of utility lines with ground penetration radar (“GPR”) and potholing (RAP Section 2.4.2)<sup>2</sup>. The DNAPL delineation PDI activities included advancing direct-push soil borings, examining and photo-documenting the cores, characterizing the soil lithologies, and recording the observable DNAPL-impacted soil intervals on the Connell Property (RAP Section 2.1) and in close proximity to the water mains (RAP Section 2.4.3).

## 2.0 PDI OF THE HORIZONTAL AND VERTICAL EXTENT OF DNAPL

### 2.1. Historical DNAPL Delineation

Soil boring data and DNAPL observations obtained from previous investigations including the Phase II Site Investigation (RMT, Inc., 2010), the Site Investigation Report (Tetra Tech and Natural Resource Technology, 2014), the Site Investigation Report Addendum (Tetra Tech, 2015), and the Supplemental Site Investigation Report (Tetra Tech, 2019), were compiled and extrapolated using Earth Volumetric Studios 2022.10.2 (“EVS”) to create a three-dimensional (“3D”) probabilistic model of the DNAPL distribution within the subsurface. Data from 239 soil borings advanced during those previous investigations were geostatistically extrapolated in EVS using adaptive gridding to define the perimeter of the historical DNAPL area. Adaptive gridding was used because it presented a better predictive model and an improved two-dimensional footprint of the DNAPL with maximum data within the footprint volume as compared to other options in the EVS program.

To enable logarithmic transformation over 4 orders of magnitude for the best geostatistical interpretation of data, confidence levels spanning 0.01 to 100 percent were used: intervals within the historical boring logs with visual DNAPL observations were assigned a DNAPL-presence confidence level of 100 percent (indicating present) while intervals visually observed to be free of DNAPL were assigned a confidence level of 0.01 percent (indicating not present). The soil boring data used in the extrapolation are included in **Appendix A**. The horizontal extent of the previously delineated DNAPL areas is shown in Figure 3.

### 2.2. Aerial Topographic Survey

Per RAP Section 2.8, on April 27, 2023, Tetra Tech completed aerial photography and photogrammetric mapping of the Site using a drone under the direct supervision of a Wisconsin Licensed Professional Land Surveyor. Reference images captured in the air by the drone were used to create computer-generated planimetric/topographic maps for Site features and preliminary surface elevations for step-out modeling. Another round of aerial photography and

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<sup>2</sup> The results of the Utility Locate Survey and Depth Verification (RAP Section 2.4.2) will be provided under a separate cover following completion of the Storm Sewer Inspection for Trench Plugs installation (RAP Section 2.4.4).

photogrammetric mapping was completed on December 14, 2023, by the Wisconsin Licensed Professional Land Surveyor, to determine the actual surface elevation of borings conducted after the relocation of previously stockpiled soil and concrete. The surface elevation from this later survey was used to create the 3D model with vertical delineation of DNAPL.

### 2.3. Pre-Field Activities

Prior to the commencement of fieldwork, several preliminary activities were performed to ensure the successful completion of the project. These included: preparing the Site Health & Safety Plan (“HASP”); reviewing Site historical documents; conducting a project kickoff meeting; procuring subcontractors and field supplies; obtaining clearance to access Depot Road and the City Utility Corridor from the City of Oak Creek Water and Sewer Utility (“OCWS”); mobilizing to the Site; and renting three standard portable toilets, a standard 20-yard dumpster, and a trailer for equipment storage.

North Shore Environmental Construction Inc. was subcontracted to clear and grub, relocate the concrete pile southwest of the foundation pads, and strip part of the stockpiled soil located northwest of the foundation pads to provide access for marking boring locations.

On September 25, 2023, Tetra Tech field staff mobilized to the Site for a review of field tasks and the HASP; preparation of the designated areas for the decontamination of drilling equipment within previously defined DNAPL areas; placement of the portable toilets and 20-yard dumpster; preparation for disposition of investigation-derived waste (“IDW”); oversight of Site clearing; and marking the remaining boring locations on the foundation pads and the paved surfaces.

### 2.4. Utility Clearance

Prior to the commencement of intrusive activities, initial proposed boring locations were sited and staked or marked after reviews of available utility drawings/documents and in consultation with OCWS. After marking the boring locations, Tetra Tech contacted the Wisconsin One Call (Diggers Hotline) to mark the underground utilities within the City Utility Corridor and the easement of the MMSD MIS System. Tetra Tech subcontracted Badger Daylighting to locate utilities in targeted areas for intrusive activities on the Connell Property by using a GPR and within the City Utility Corridor by potholing/test pitting.

### 2.5. Initial Boring Location Stake out/Marking/Survey

On September 13 through 15, 2023, 185 initial proposed soil boring locations for the 2023 PDI were staked/marked by Kapur & Associates, Inc. (Wisconsin-licensed surveyor) and Tetra Tech field staff based on the initial locations proposed in the RAP and the utility clearance activities discussed above. Of the 185 initial proposed soil boring locations, 149 locations were to delineate the horizontal extent of DNAPL (labeled with the prefix “HOR”); 23 locations were to determine/confirm the depth/base of the DNAPL (labeled with the prefix “VD”); and 13 locations were to determine the top of the DNAPL (labeled with the prefix “TD”).

Tetra Tech field staff marked 47 locations in the utility corridor, with 27 locations marked along the 30-inch nominal RCPP raw water line north of the access road (labeled with the prefix “UT-N”) and 20 locations marked along the 36-inch nominal PCCP raw water line south of the access road (labeled with the prefix “UT-S”).



After completion of the initial stake out, Tetra Tech field staff surveyed the marked/staked locations using an EOS Arrow Gold+™ Real-Time Kinematic (“RTK”) Global Navigation Satellite System (“GNSS”). The receiver had a horizontal accuracy of 0.3 inches and a vertical accuracy of 0.8 inches. The surveyed data and features were loaded into Tetra Tech’s ArcGIS Online database for storage and interactive map preparation. The surveyed horizontal locations were referenced to the Wisconsin State Plane Coordinate System and the vertical elevations were referenced to the North American Vertical Datum of 1988 (NAVD88; US feet). All borehole locations are shown in Figure 4.

## 2.6. Borehole Advancement

Borings were advanced at the marked/staked locations by On-Site Environmental Services, Inc. and Probe Technologies, Inc. (Wisconsin-licensed drillers) under full-time oversight by Tetra Tech using a direct-push method. In this method, a conventional Geoprobe rig and/or truck-mounted hydraulically powered Geoprobe rig were used to advance boreholes using a hammer and the weight of the equipment. Continuous soil samples were collected in clear 5-foot thin-walled Lexan liners installed in the sealed casing of the Geoprobe rod. Per Section 2.1.1 of the RAP, samples for horizontal and vertical delineation were collected at 5-foot intervals to a depth of at least 20 feet below ground surface (bgs). Sampling extended by 5 feet intervals when DNAPL was observed between 18 and 20 feet bgs. Locations advanced for delineation of non-DNAPL impacted overburden (RAP Section 2.1.1.3) were drilled until the first DNAPL indication was observed in the core.

During the borehole advancement, refusal was encountered at depths ranging from 4 to 15 feet at 18 locations (as shown in Figure 5) likely due to these locations being situated on the foundations of former subsurface structures.

Drilling equipment was pressure washed for decontamination prior to drilling, between drilling locations, and upon completion of drilling activities within designated DNAPL areas.

## 2.7. Core Sample Collection and Examination

All core samples collected in the liners were split in half, photographed, described (based on the Munsell geological color chart, texture, and plasticity), and classified according to the Unified Soil Classification System (American Society of Testing Materials Method D-2488-75). The samples were visually inspected for the presence of DNAPL and classified based on the following criteria as defined in Section 2.1.2 of the RAP:

- No visible evidence: No visible evidence of NAPL in soil or sediment.
- Hard Tar: Weathered, brittle, granular black or brown solid or semi-solid with a tarlike consistency. Immobile, behaves like a solid and typically observed within fractures of fine-grained soil or sediment.
- Sheen: Any visible sheen in the water on soil, sediment particles, or the core.
- Staining: Visible brown or black staining in soil or sediment. Can be visible as mottling or in bands and typically associated with fine-grained soil or sediment.

- Coating: Visible brown or black NAPL coating soil or sediment particles, and typically associated with coarse-grained soil or sediment such as coarse sand, gravel, or cobbles.
- Wetted NAPL: Visible brown or black NAPL wetting the soil or sediment sample. NAPL appears as a liquid and is not held by soil or sediment grains.

After the visual inspection of the core samples, samples were screened for the presence of VOCs using a calibrated photoionization detector (“PID”). The soil descriptions and classifications, sampling intervals, DNAPL classifications, and PID readings are presented in the soil boring logs (WDNR Form 4400-122) in **Appendix B**. The photographic logs of the borings are presented in **Appendix C**.

## 2.8. Borehole Abandonment

After visually inspecting the last clean core sample, the advanced boreholes were abandoned according to the requirements outlined in the Wisconsin Administrative Code NR § 141.25. The boring locations were filled with bentonite chips from the bottom of the hole up to the ground surface after drilling. The Well/Drillhole/Borehole Filling and Sealing Forms (WDNR Form 3300-005) are included in **Appendix D**.

## 2.9. IDW Management

IDW generated during the field investigation included solid and liquid wastes. The liquid wastes comprised the fluid generated by pressure washing of drilling equipment. Solid wastes including drill/soil cuttings and sludges were placed at the designed staging area for incorporation into the ISS mix during the planned remedial activities. The staging area is lined with 6-mil black heavy-duty poly plastic sheeting.

Incidental wastes including personal protective equipment, plastic sheets, disposable materials (e.g., used Lexan liners), and general trash were placed in trash bags at the point of generation. These materials were disposed of in the dumpster after the close of each workday’s activities for off-site disposal. The liners were cleaned to remove any DNAPL-impacted soil residue before they were disposed of.

## 2.10. Site DNAPL Horizontal Delineation, Step-out Locations Determination, and Survey

Data from the 232 initial soil boring locations of the 2023 PDI (185 soil boring locations on the Connell Property and 47 soil boring locations within the City Utility Corridor) and the 239 soil borings advanced during previous investigations were modeled in the EVS software to generate a 3D geostatistical model to show the extent of DNAPL impact, optimize step-out location determination, and define the DNAPL perimeter in accordance with the procedures described in the RAP, Section 2.1 (Delineation of Horizontal and Vertical Extent of DNAPL).

Intervals within the 2023 PDI boring logs with DNAPL observations (i.e., materials classified as Sheen, Staining, Coating, or Wetted NAPL as defined in the RAP, Section 2.1.2) were assigned a DNAPL-presence confidence level of 100 percent (indicating present) and intervals that were observed to be free of DNAPL (i.e., materials classified as No Visible Evidence, or Hard Tar as

defined in the RAP, Section 2.1.2)<sup>3</sup> were assigned 0.01 percent (indicating not present; to enable logarithmic transformation over 4 orders of magnitude) for geostatistical interpretation of the data. Step-out locations were selected and spaced out around the perimeter of the EVS generated DNAPL-impacted area. Secondary step-out locations were identified between the step-out locations spaced around the perimeter, to be advanced if the first (furthest) perimeter step-out location did not contain DNAPL material. If DNAPL material was encountered in the the first (furthest) step-out location, additional step-out locations were completed to find the clean perimeter.

A total of 288 offset borings were advanced to define the perimeter of the DNAPL areas, which was established based on observations free of DNAPL impacts within the core intervals. Note that 15 of the 288 offset borings were actually “step-in” locations in an attempt to better define the extent of the DNAPL perimeter.

WDNR’s oversight consultant Terracon was present and observed all borehole advancements and was in agreement with all step-out/step-in locations.

All 2023 PDI boring locations were surveyed by Tetra Tech field staff using an EOS Arrow Gold+™ RTK GNSS. The surveyed horizontal locations were referenced to the Wisconsin State Plane Coordinate System and the vertical elevations were referenced to NAVD88 (US feet).

A total of 520 borings were drilled for DNAPL delineation during the 2023 PDI for horizontal, vertical and top of DNAPL delineation within the Connell Property, and for DNAPL delineation within the City Utility Corridor. In addition, a single boring performed by Ramboll on behalf of Connell for PCB delineation (per RAP Section 2.6) encountered DNAPL impacts. This boring also was included in the 3D geostatistical model. By including the borings from previous investigations, a total of 3,814 core intervals from 760 boring locations were compiled for the creation of the final 3D model. The boring locations performed during the 2023 PDI and the previous investigations that were used to generate the final 3D model are depicted in Figure 6. The soil boring data used in generating the model are included in **Appendix A**.

The areal extent of delineated DNAPL material at the Site is shown in Figure 7. All core samples examined to define the clean perimeter were observed to be free of DNAPL (i.e., materials classified as No Visible Evidence, or Hard Tar as defined in the RAP, Section 2.1.2), with the exception of borings HOR-104A and HOR-103C. DNAPL material was identified at 7.2 to 8.3 feet bgs and 15 to 15.9 feet bgs at HOR-104A and from 7 to 9.5 feet bgs at HOR-103C. Additional step-out borings, however, could not be advanced because borings HOR-104A and HOR-103C

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<sup>3</sup> This approach to defining observed DNAPL material is consistent with the approach utilized in all previous investigations conducted at the Site where the term “potentially mobile tar” was utilized instead of Dense Non-Aqueous Phase Liquid (DNAPL). For example, Section 6.1.1 of the Site Investigation Report (Tetra Tech and Natural Resource Technology, 2014) includes the following statement: “Observations of tar are included in the right hand margin of each boring log... These observations do not include dry, hardened pieces of tar that are immobile.” The Supplemental Site Investigation Report (Tetra Tech, 2019) utilized a similar approach and includes similar language. This distinction served as the underlying premise for all previously prepared DNAPL (or potentially mobile tar) delineation assessments, figures, volume calculations, etc., and this approach was maintained for the 2023 PDI DNAPL delineation assessment. Additionally, WDNR’s oversight consultant, Terracon, was present throughout all 2023 PDI activities, observed all DNAPL delineation borings, and concurred that step out borings were not necessary for boreholes where materials were classified as No Visible Evidence, or Hard Tar.

are located on the edge of a steep incline; therefore, step-out borings could not be safely performed by the drill rigs.

### **3.0 PDI OBSERVATION**

#### **3.1. Connell Property DNAPL-Impacted Soil**

The extrapolated data in the EVS program indicates areas of DNAPL-impacted soil on the Connell Property have a combined surface area of approximately 363,600 square feet (SF) (~8.35 acres) (designated as Areas 1 through 4; see Figure 7). The estimated areas and volumes of the DNAPL-impacted areas on the Connell Property are presented in Table 1.

A detailed DNAPL-impacted soil distribution configuration on the Connell Property and within the City Utility Corridor Lot 1 is provided in Figure 7, and Figure 8 also identifies the locations of seven cross-sections showing the vertical and lateral extents of the DNAPL impacts, which are presented in Figures 9 through 15. The depth to the uppermost DNAPL observation at each borehole is shown in Figure 16. The depth to the bottom of the lowermost DNAPL observation at each borehole is shown in Figure 17. The difference between the top and bottom of observed DNAPL at each borehole location is shown in Figure 18.

#### **3.2. Water Main DNAPL-Impacted Soil**

DNAPL-impacted soil along the north and south water mains as extrapolated in the EVS program is shown on Figures 7 and 8. Cross sections depicting observations of DNAPL-impacted material along the north and south water mains are shown in Figures 14 and 15. The length of DNAPL-impacted soil along the north water main is approximately 230 feet with depths ranging from 0.7 to 17 feet below grade with an average top of DNAPL-impacted depth of 5.4 feet and an average bottom of DNAPL-impacted depth of 12.2 feet. Along the south water main, the length of DNAPL-impacted soil is approximately 240 feet with depths ranging from 0.8 to 13 feet below grade with an average top of DNAPL-impacted depth of 4.0 feet and an average bottom of DNAPL-impacted depth of 10.6 feet. Within the area of observed DNAPL impacts, the invert depth of the north water main ranges from 6 to 14 feet below grade, and the invert depth of the south water main ranges from 6 to 11 feet below grade. Table 2 presents the volumes of the DNAPL-impacted soil along the north and south water mains above and within a lateral distance of no less than 5 feet on either side of the north and south water mains (raw water intake lines).

#### **3.3. Overburden Soil Not Impacted by DNAPL**

The overburden soil not impacted by DNAPL consists mainly of silty clay, low to medium plasticity clay till, and clayey silt, with few discontinued sand and gravel lenses overlying the high plasticity clay till. The depth of overburden soil not impacted by DNAPL varies from 0.3 to 13.5 feet bgs. The estimated average depths and volumes of overburden soil not impacted by DNAPL are shown in Table 1 for the Connell Property and Table 2 for the City Utility Corridor. Cross-section locations through the Site are shown in Figure 8 and cross-sections showing the extent of the overburden soil not impacted by DNAPL are presented in Figures 9 through 15.

## 4.0 REMEDIAL DESIGN CONSIDERATIONS

Per the RAP, the RDR will present a determination of the specific areas and depths requiring ISS on the Connell Property, and additionally account for PCB-impacted soil removal to be conducted by Connell prior to implementation of ISS by Beazer to address DNAPL-impacted soil. The RDR will present a determination of the specific area and depth of DNAPL-impacted soil and a remedial approach for the MIS. The RDR will also present a determination of the DNAPL-impacted soil to be removed from the vicinity of the water lines in the City Utility Corridor.

Design of the ISS treatment of DNAPL-impacted soil on the Connell Property, including excavated and relocated DNAPL-impacted soil from around the water mains within the City Utility Corridor, will be based on the results of this PDI, the ongoing ISS treatability study, and an evaluation of constructability. The ISS treatability study will develop an ISS mix design using readily available reagent materials capable of solidifying/stabilizing the targeted DNAPL-impacted soils to immobilize and encapsulate the DNAPL. The ISS treatability study will assess the physical properties of the post-solidified/stabilized materials and the volumetric expansion (swell) of the soil during the ISS operation. The remedial design to be presented in the RDR will account for the varying depths of the top and bottom of the DNAPL-impacted soil to be treated, the volume of reagent materials to be included in the mix during ISS, the methods of incorporating the reagent materials, and the management of the net volume of the soil due to anticipated swell.

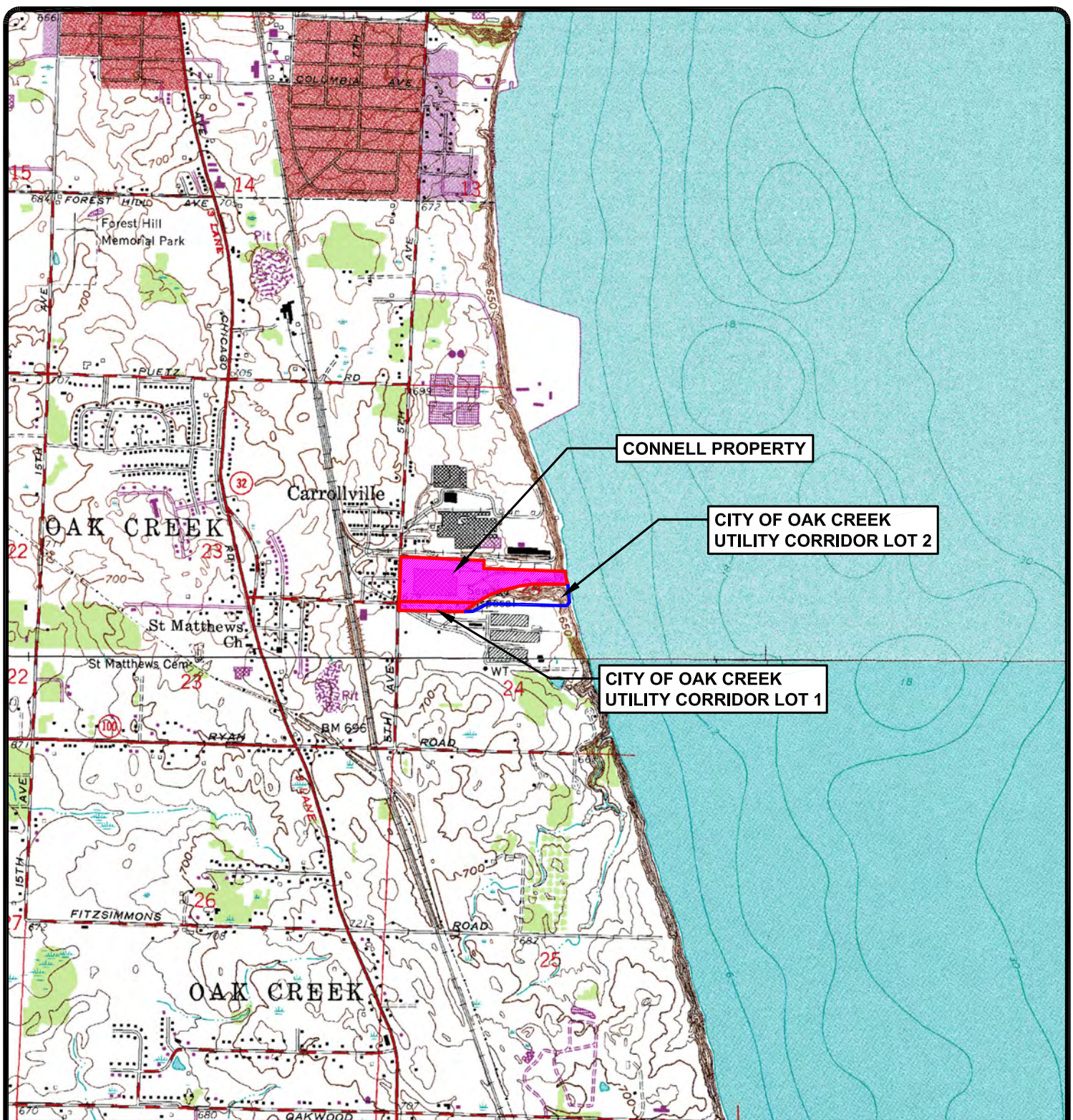
As discussed above, limits of DNAPL in the vicinity of HOR-104A and HOR-103C, located on the edge of a steep incline, were not defined because step-out borings could not be safely performed by the drill rigs. The remedial approach for this area will be detailed in the RDR.

## REFERENCES

- RMT, Inc., 2010. Phase II Site Investigation, Former Wabash Alloys Aluminum Recycling Facility, Oak Creek, WI, August.
- Tetra Tech, Inc. and Natural Resource Technology, Inc., 2014. Site Investigation Report, Former Koppers Tar Plant and Wabash Alloys Site, Oak Creek, WI, January.
- Tetra Tech, Inc., 2015. Site Investigation Report Addendum, Buried Utility Migration Pathway and Off-Site Extent of Contamination Assessment, Former Koppers Tar Plant and Wabash Alloys Site and City of Oak Creek Utility Corridor Lot 1, Oak Creek, WI, June.
- Tetra Tech, Inc., 2019. Supplemental Site Investigation, Former Koppers Tar Plant and Wabash Alloys Site, Oak Creek, WI, January.
- Tetra Tech, Inc. and Ramboll, Inc., 2023. Conceptual Remedial Action Plan, Former Koppers Tar Plant and Wabash Alloys Site and City of Oak Creek Utility Corridor Lot 1, Oak Creek, WI, July.

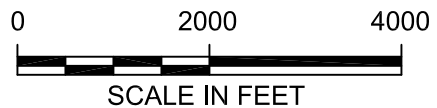
## FIGURES





National Geodetic Vertical Datum of 1929  
Contour Interval 10 Feet

 SITE



QUADRANGLE LOCATION



Base map from U.S.G.S. 7.5' SOUTH MILWAUKEE, WISCONSIN  
and RACINE NORTH, WISCONSIN topographic quadrangle map.

TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE  
SITE LOCATION AND LOCAL TOPOGRAPHY

LOCATION: OAK CREEK, WISCONSIN



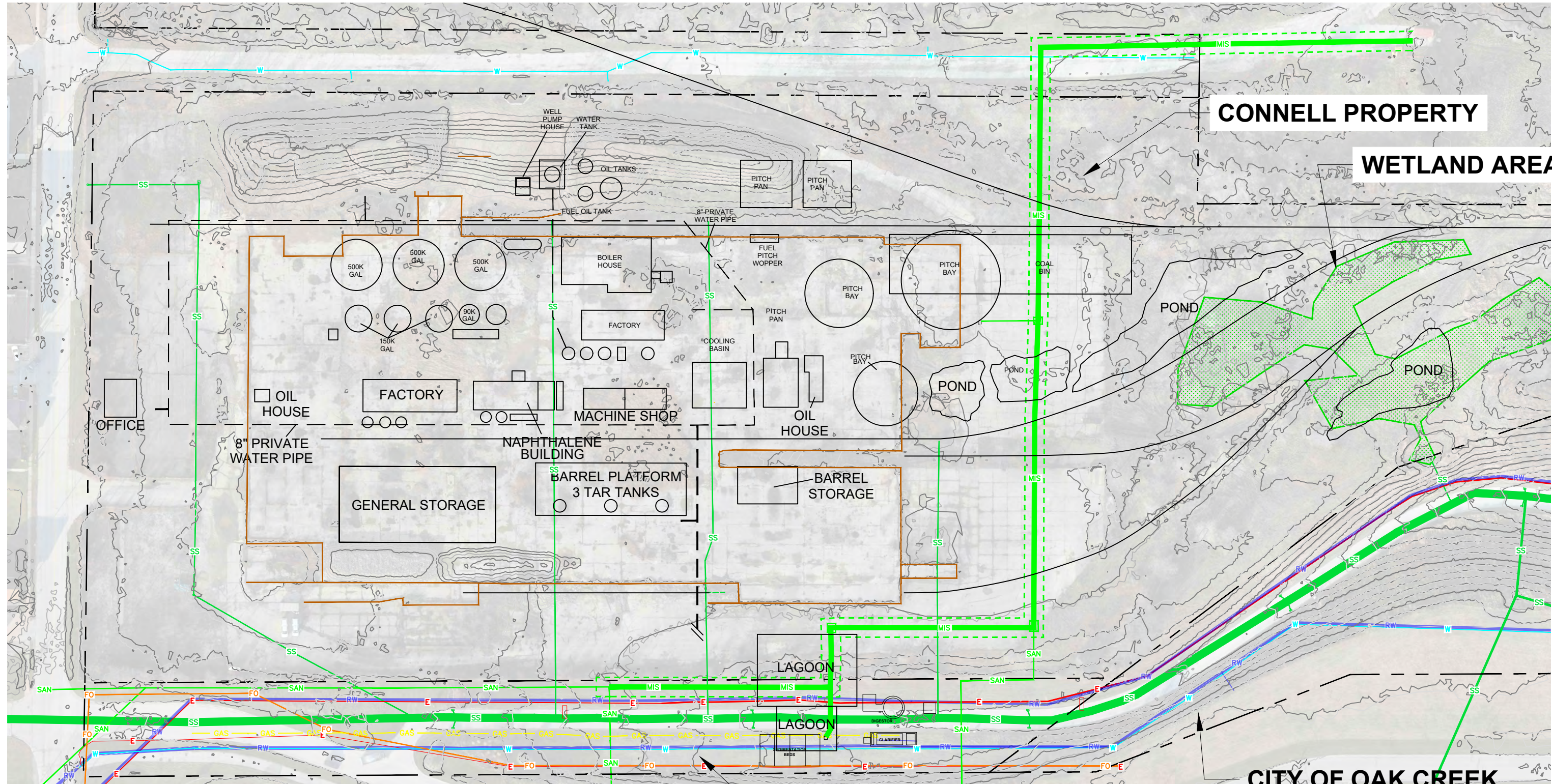
TETRA TECH

APPROVED	MRN
DRAFTED	CMP
PROJECT#	117-2201512
DATE	02/09/2024

FIGURE

1





**CONNELL PROPERTY**

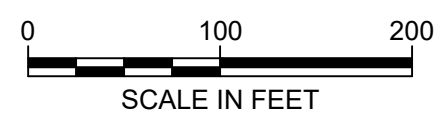
**WETLAND AREA**

**CITY OF OAK CREEK  
UTILITY CORRIDOR LOT 1**

**CITY OF OAK CREEK  
UTILITY CORRIDOR LOT 2**

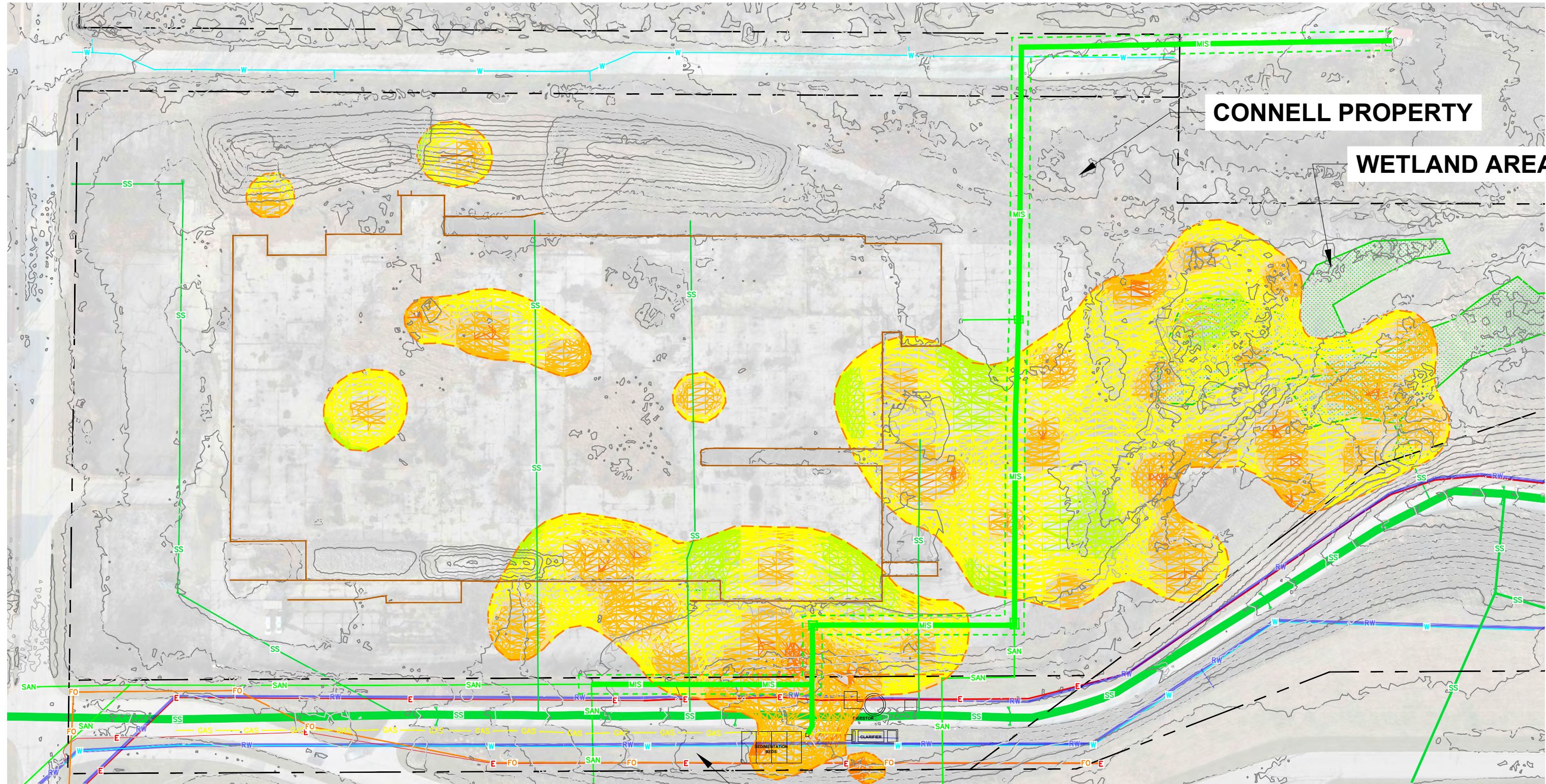
- LEGEND**
- DECEMBER 2023 TOPOGRAPHIC MAJOR CONTOURS (10 FT)
  - DECEMBER 2023 TOPOGRAPHIC MINOR CONTOURS (2 FT)
  - STORM SEWER
  - SANITARY SEWER
  - MIS SANITARY SEWER
  - BURIED ELECTRIC
  - BURIED FIBER OPTIC
  - BURIED GAS LINE
  - RAW WATER LINE
  - POTABLE WATER LINE
  - PROPERTY LINES
  - CURRENT DELINEATED WETLAND
  - FORMER TAR PLANT FACILITIES AND FORMER WWTP STRUCTURES
  - PAD FOUNDATION
  - MIS RIGHT OF WAY EASEMENT

\*TOPOGRAPHIC CONTOURS AND AERIAL PHOTO FROM DECEMBER 2023 DRONE SURVEY



TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE			
SITE HISTORICAL LAYOUT			
LOCATION: OAK CREEK, WISCONSIN			
	CHECKED	MRN	FIGURE: <b>2</b>
	DRAFTED	JRD	
	PROJECT	117-2201512	
	DATE	02/09/2024	





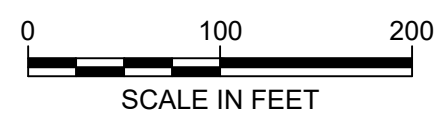
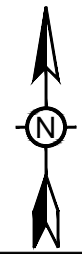
**CONNELL PROPERTY**

**WETLAND AREA**

**CITY OF OAK CREEK  
UTILITY CORRIDOR LOT 1**

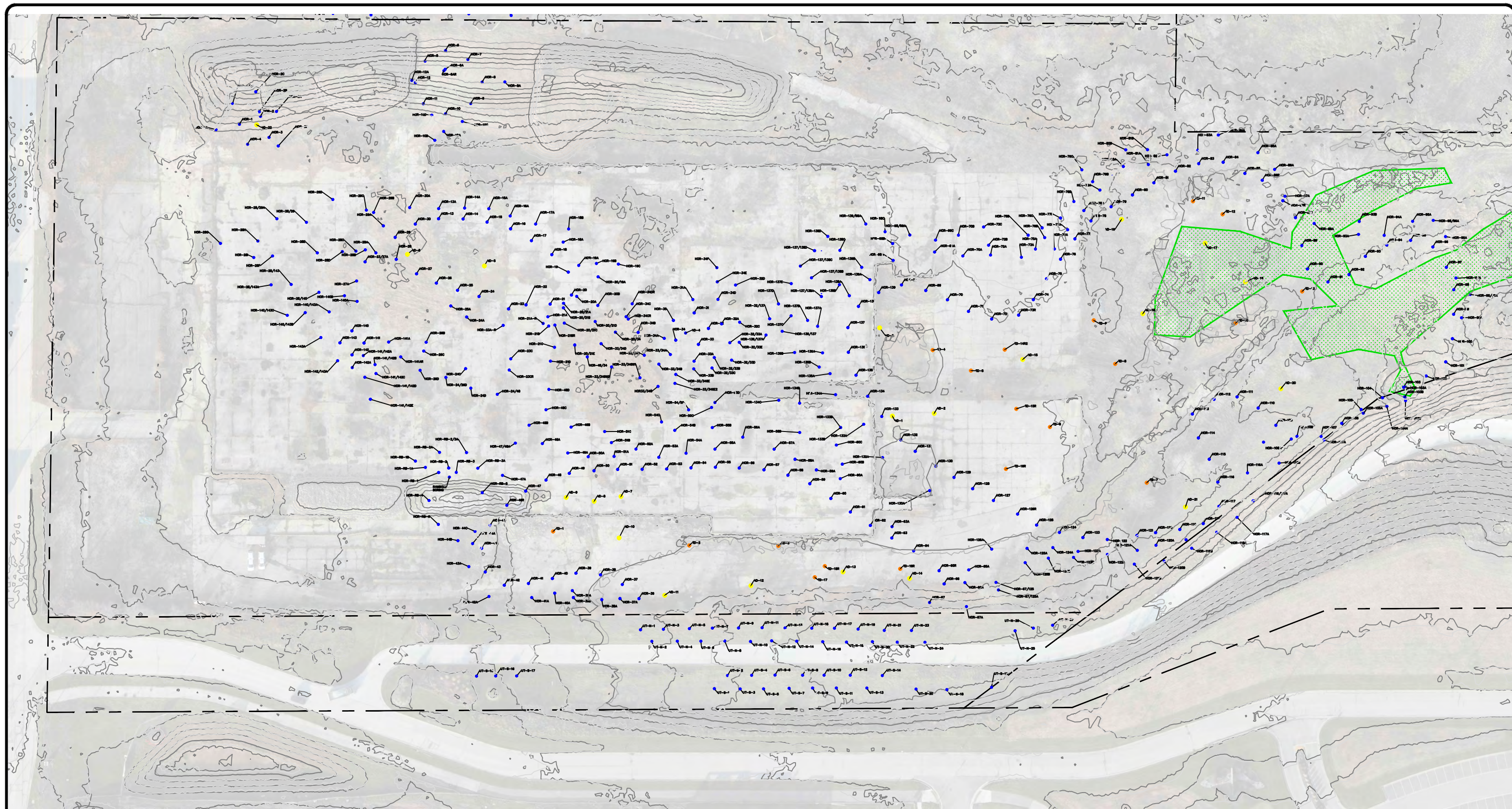
- LEGEND**
- DECEMBER 2023 TOPOGRAPHIC MAJOR CONTOURS (10 FT)
  - DECEMBER 2023 TOPOGRAPHIC MINOR CONTOURS (2 FT)
  - DNPAL DISTRIBUTION BASED ON PREVIOUS (2010-2019) INVESTIGATION
  - SS — STORM SEWER
  - SAN — SANITARY SEWER
  - MIS — MIS SANITARY SEWER
  - BURIED ELECTRIC
  - FO — BURIED FIBER OPTIC
  - GAS — BURIED GAS LINE
  - RW — RAW WATER LINE
  - POTABLE WATER LINE
  - — PROPERTY LINES
  - — FORMER TAR PLANT FACILITIES AND FORMER WWTP STRUCTURES
  - — PAD FOUNDATION
  - — CURRENT DELINEATED WETLAND
  - — MIS RIGHT OF WAY (ROW) EASEMENT

\*TOPOGRAPHIC CONTOURS AND AERIAL PHOTO FROM DECEMBER 2023 DRONE SURVEY

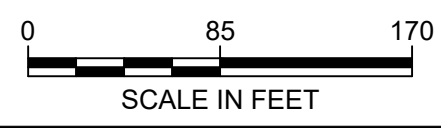
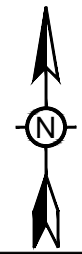


TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE			
SITE HISTORICAL DNPAL DISTRIBUTION			
LOCATION: OAK CREEK, WISCONSIN			
	CHECKED	MRN	FIGURE: <b>3</b>
	DRAFTED	JRD	
	PROJECT	117-2201512	
	DATE	02/09/2024	



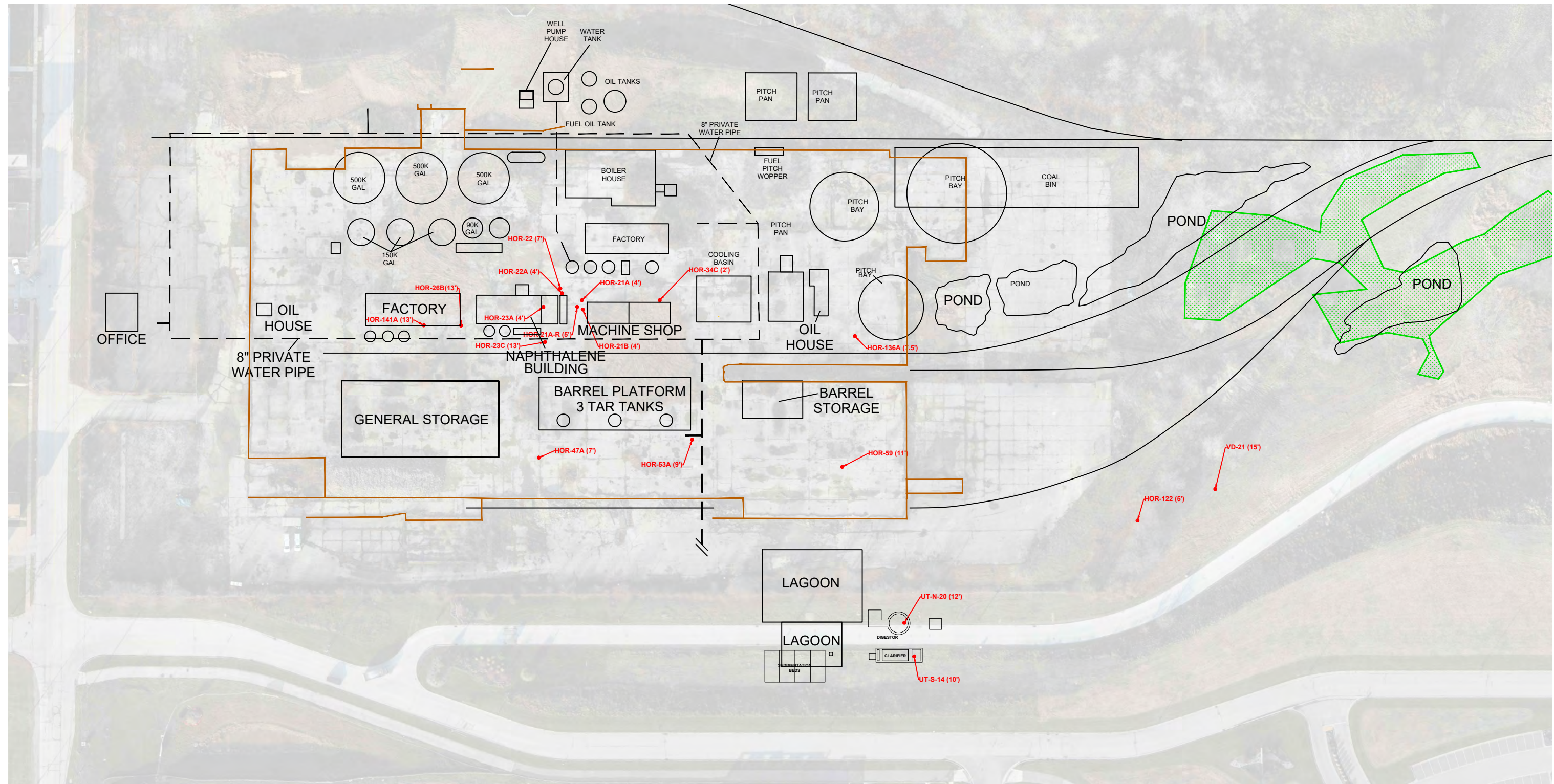


- LEGEND**
- 2023 PDI HORIZONTAL DELINEATION BORINGS
  - 2023 PDI TOP OF DNAPL BORINGS
  - 2023 PDI VERTICAL DELINEATION BORINGS
  - PROPERTY LINES
  - CURRENT DELINEATED WETLAND



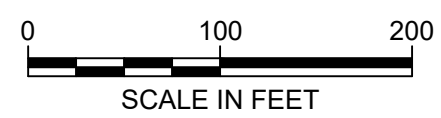
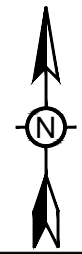
TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE			
BORING LOCATION AND IDENTIFICATION MAP			
LOCATION: OAK CREEK, WISCONSIN			
	CHECKED	MRN	FIGURE: 4
	DRAFTED	JRD	
	PROJECT	117-2201512	
	DATE	02/09/2024	





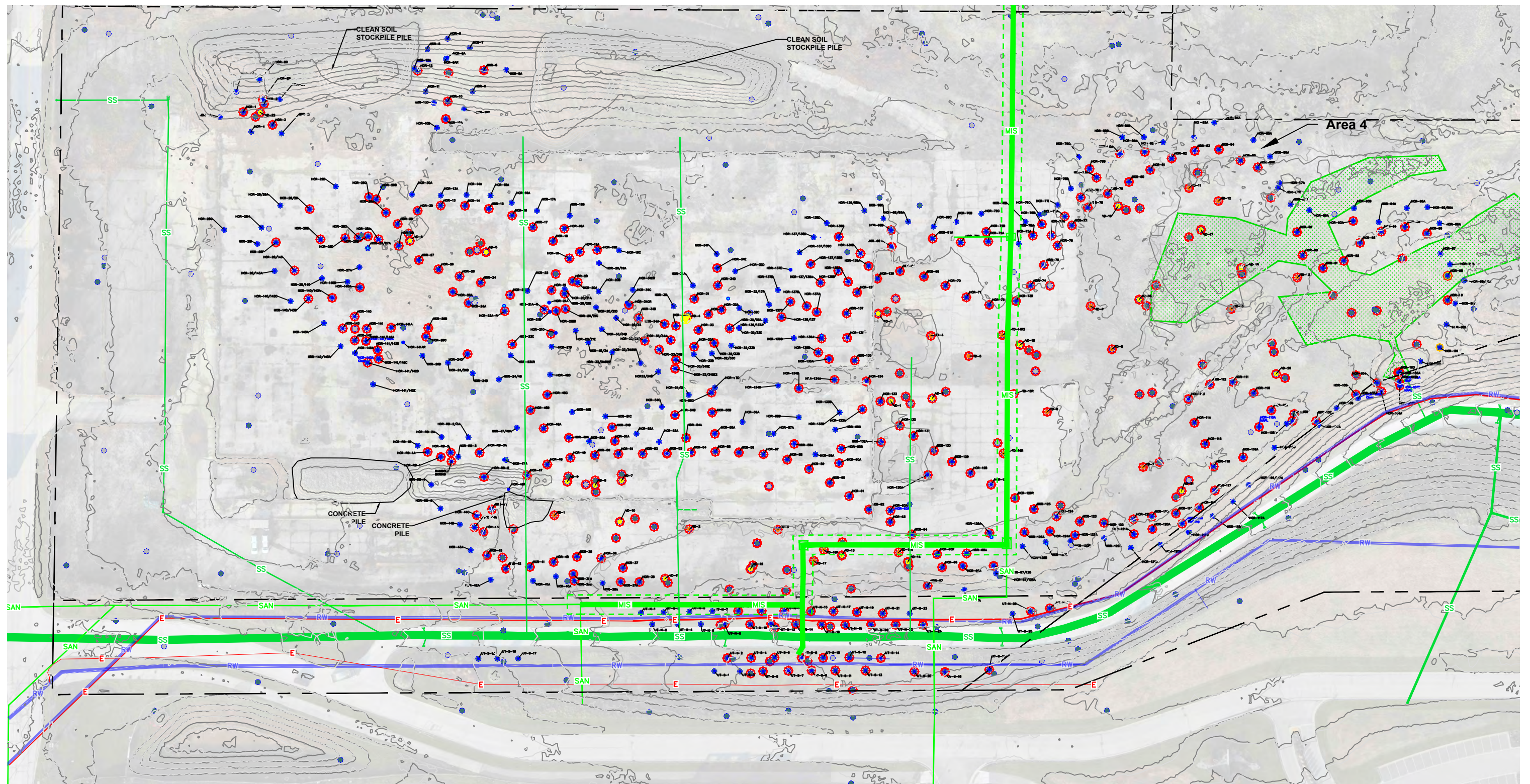
**LEGEND**

- 2023 PDI SOIL BORING WITH REFUSAL
- FORMER TAR PLANT FACILITIES AND FORMER WWTP STRUCTURES
- PROPERTY LINES
- CURRENT DELINEATED WETLAND



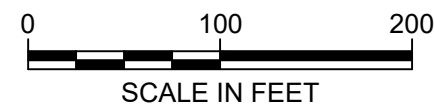
TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE BORING REFUSAL LOCATIONS			
LOCATION: OAK CREEK, WISCONSIN			
	CHECKED	MRN	FIGURE: <b>5</b>
	DRAFTED	JRD	
	PROJECT	117-2201512	
	DATE	02/09/2024	





**LEGEND**

- HORIZONTAL DELINEATION BORINGS
- TOP OF DNAPL (TD) BORING ONSITE
- VERTICAL DELINEATION BORING
- BORING NO DNAPL
- BORING WITH DNAPL
- SANITARY SEWER
- MIS SANITARY SEWER
- RAW WATER LINES
- BURIED ELECTRIC LINES
- DECEMBER 2023 TOPOGRAPHIC MAJOR CONTOURS (10 FT)
- DECEMBER 2023 TOPOGRAPHIC MINOR CONTOURS (2 FT)
- PROPERTY LINES
- ▨ CURRENT DELINEATED WETLAND
- MIS ROW EASEMENT
- STORM SEWER



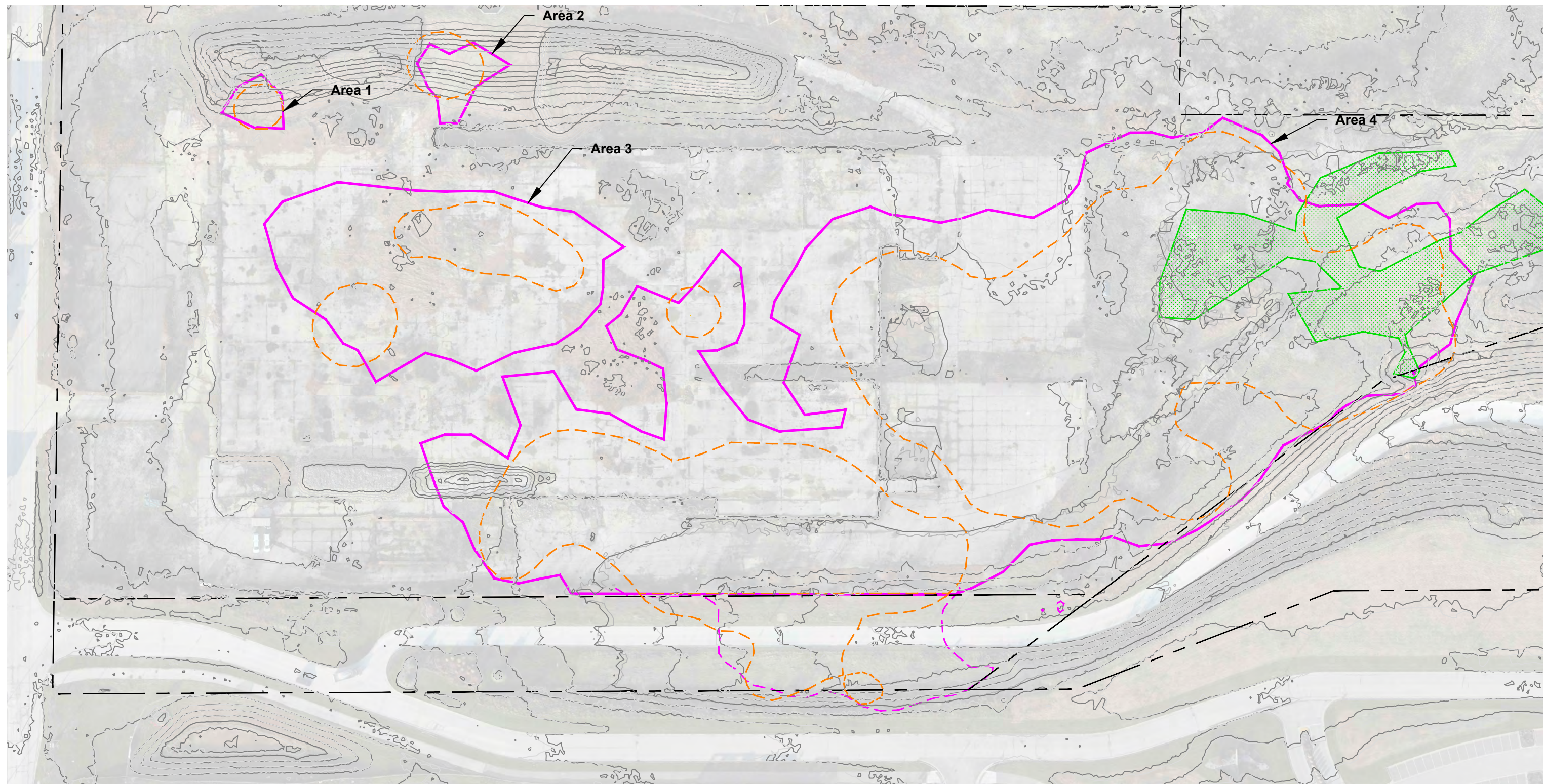
TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE  
EVS MODEL BOREHOLE LOCATIONS

LOCATION: OAK CREEK, WISCONSIN



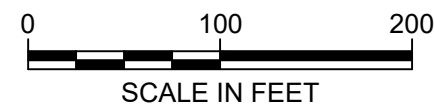
CHECKED	MRN	FIGURE: <b>6</b>
DRAFTED	JRD	
PROJECT	117-2201512	
DATE	02/09/2024	





**LEGEND**

- TOPOGRAPHIC MAJOR CONTOURS (10 FT)
- TOPOGRAPHIC MINOR CONTOURS (2 FT)
- - - HISTORICAL MODELED HORIZONTAL DNAPL EXTENTS
- LIMITS OF DNAPL-IMPACTED SOIL (EVS MODEL, INCLUDING 2023 PDI DATA) - CONNELL PROPERTY
- LIMITS OF DNAPL-IMPACTED SOIL (EVS MODEL, INCLUDING 2023 PDI DATA) - UTILITY CORRIDOR
- - - PROPERTY LINES
- CURRENT DELINEATED WETLAND



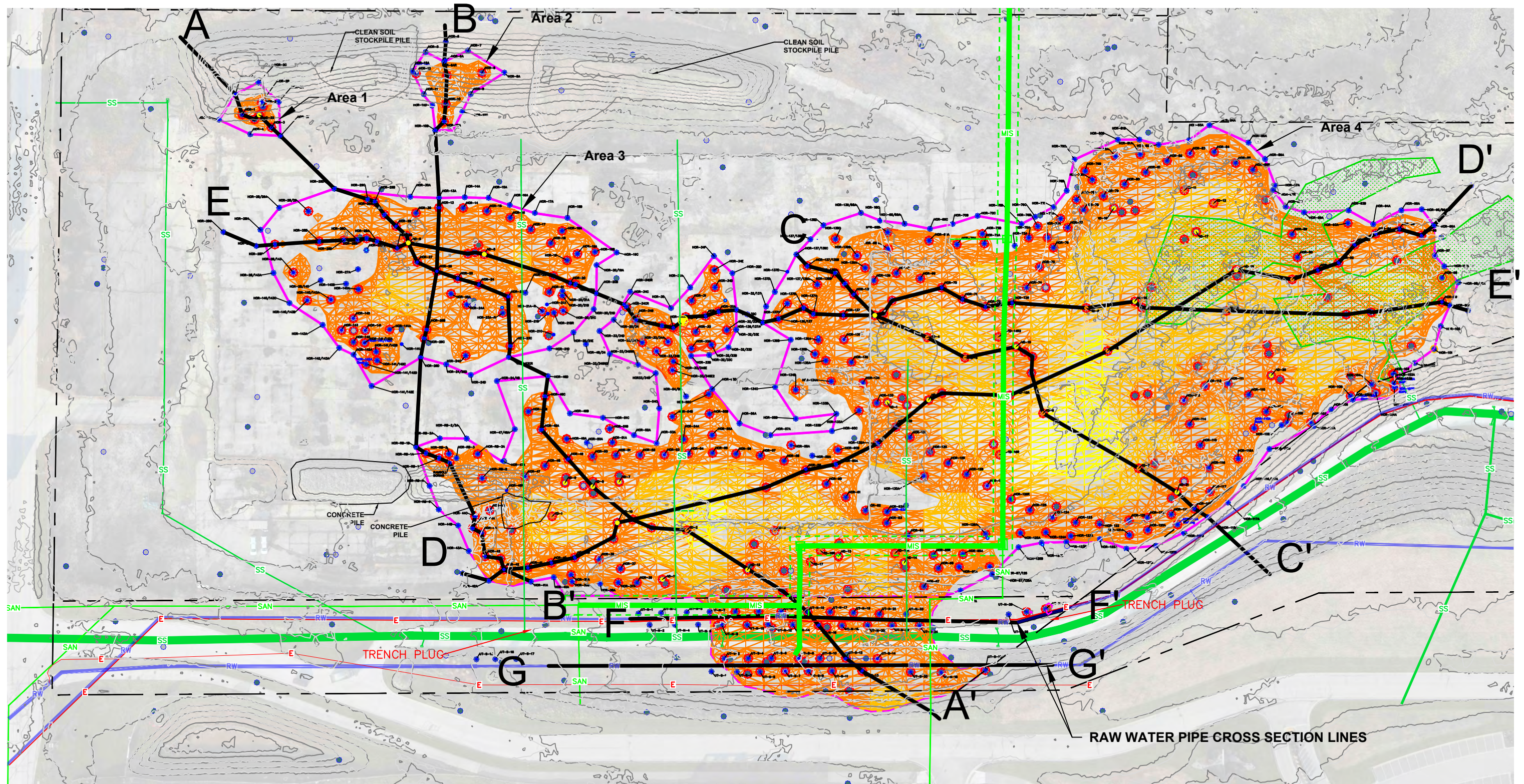
TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE  
 HISTORICAL AND CURRENT DNAPL DISTRIBUTION

LOCATION: OAK CREEK, WISCONSIN



CHECKED	MRN	FIGURE: <b>7</b>
DRAFTED	JRD	
PROJECT	117-2201512	
DATE	02/09/2024	

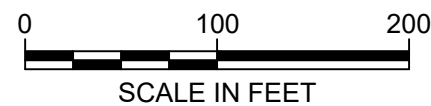
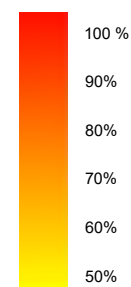




**LEGEND**

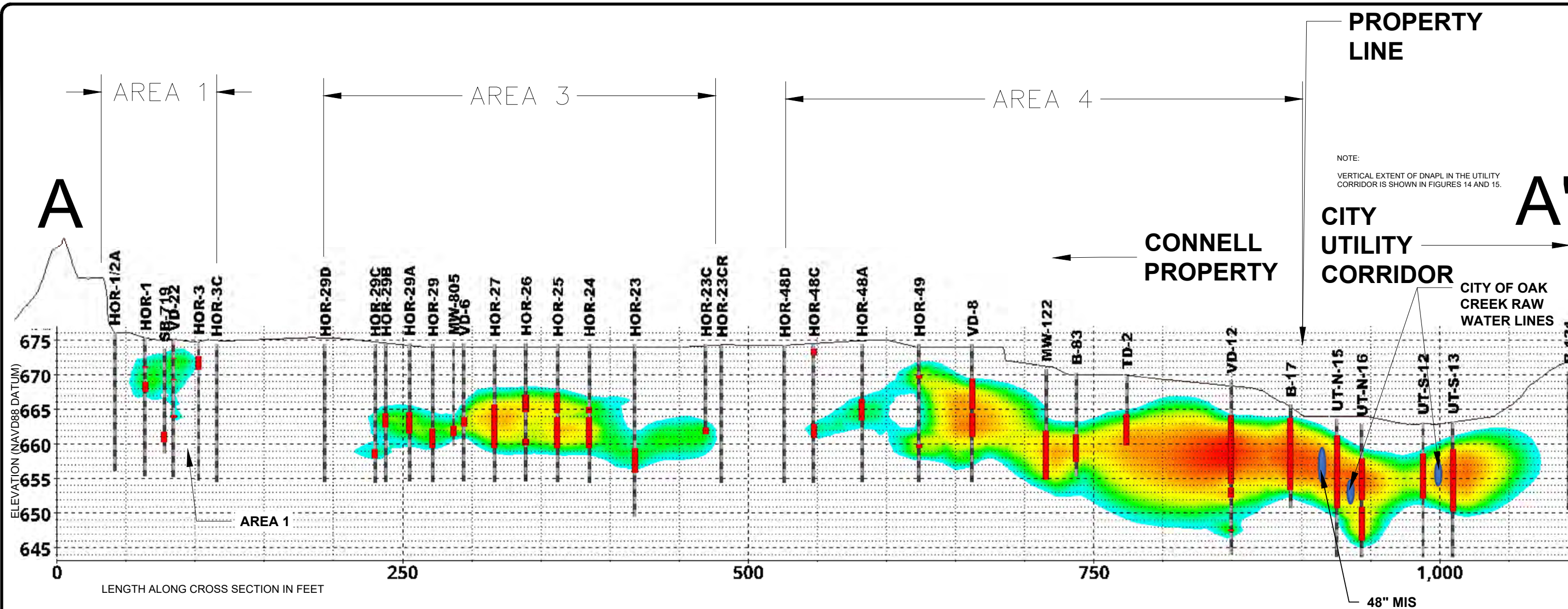
- HORIZONTAL DELINEATION BORINGS
- TOP OF DNAPL (TD) BORING ONSITE
- VERTICAL DELINEATION BORING
- BORING NO DNAPL
- BORING WITH DNAPL
- SANITARY SEWER
- MIS SANITARY SEWER
- RAW WATER LINES
- BURIED ELECTRIC LINES
- DECEMBER 2023 TOPOGRAPHIC MAJOR CONTOURS (10 FT)
- DECEMBER 2023 TOPOGRAPHIC MINOR CONTOURS (2 FT)
- PROPERTY LINES
- ▨ CURRENT DELINEATED WETLAND
- LIMITS OF DNAPL-IMPACTED SOIL (EVS MODEL, INCLUDING 2023 PDI DATA) - CONNELL PROPERTY
- LIMITS OF DNAPL-IMPACTED SOIL (EVS MODEL, INCLUDING 2023 PDI DATA) - UTILITY CORRIDOR
- MIS ROW EASEMENT
- STORM SEWER

**MODELED DNAPL DISTRIBUTION CONFIDENCE**



TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE			
SOIL BORING AND CROSS SECTION LOCATIONS			
LOCATION: OAK CREEK, WISCONSIN			
	CHECKED	MRN	FIGURE: <b>8</b>
	DRAFTED	JRD	
	PROJECT	117-2201512	
	DATE	02/09/2024	





NOTE:  
VERTICAL EXTENT OF DNAPL IN THE UTILITY CORRIDOR IS SHOWN IN FIGURES 14 AND 15.



CROSS SECTION LOCATION MAP  
NOT TO SCALE

**DNAPL PRESENT (%)**

- DNAPL Present
- DNAPL Data Cropped at 0.1
- DNAPL Not Present

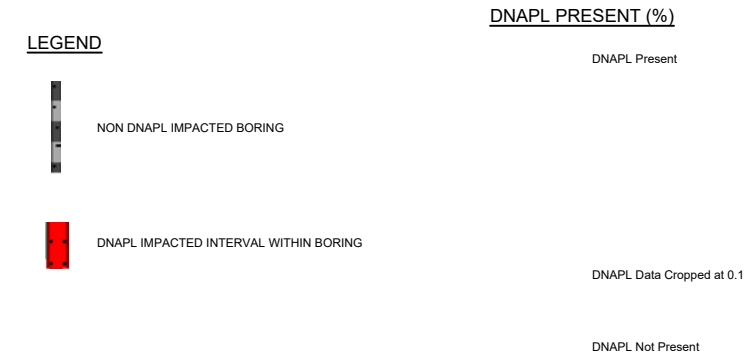
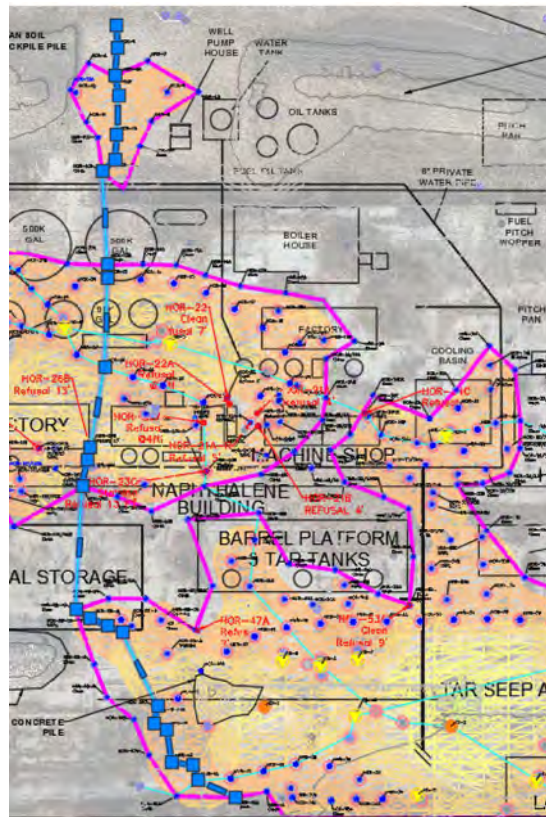
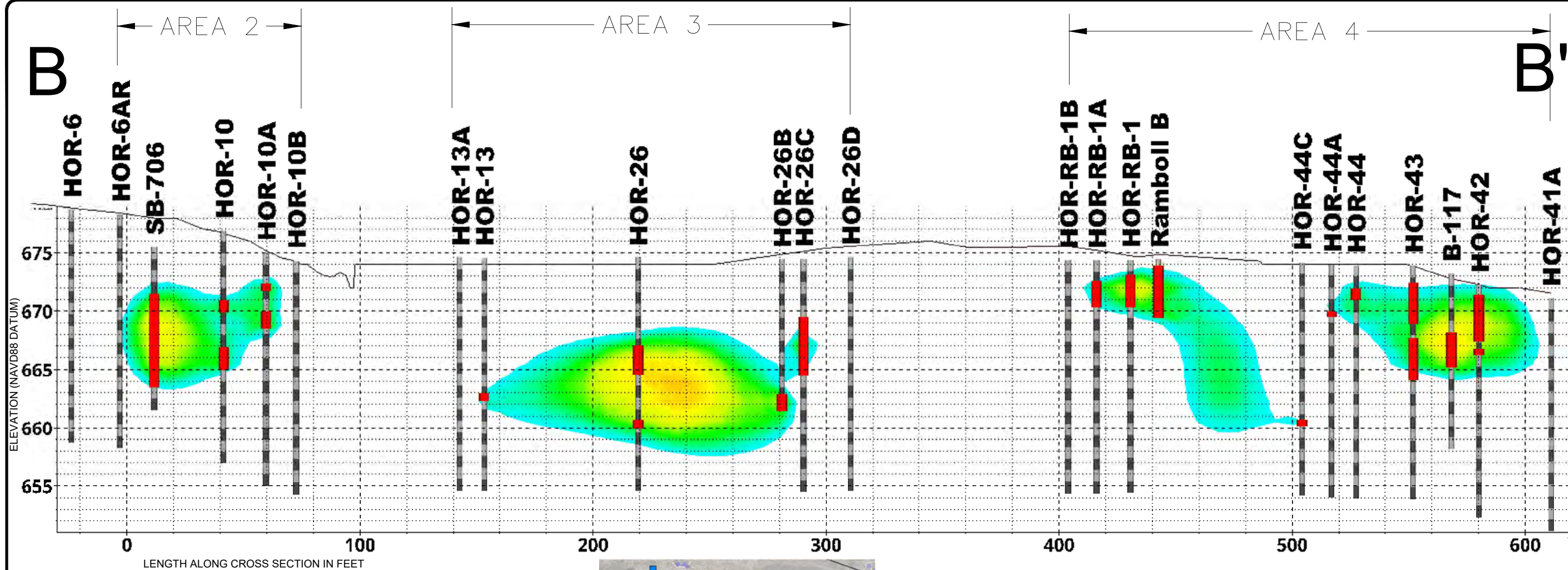
**LEGEND**

- NON DNAPL IMPACTED BORING
- DNAPL IMPACTED INTERVAL WITHIN BORING

0 70 140  
HORIZONTAL SCALE IN FEET  
5X VERTICAL EXAGGERATION

TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE			
CROSS SECTION A - A'			
LOCATION: OAK CREEK, WISCONSIN			
	CHECKED	MRN	FIGURE: 9
	DRAFTED	JRD	
	PROJECT	117-2201512	
	DATE	02/09/2024	





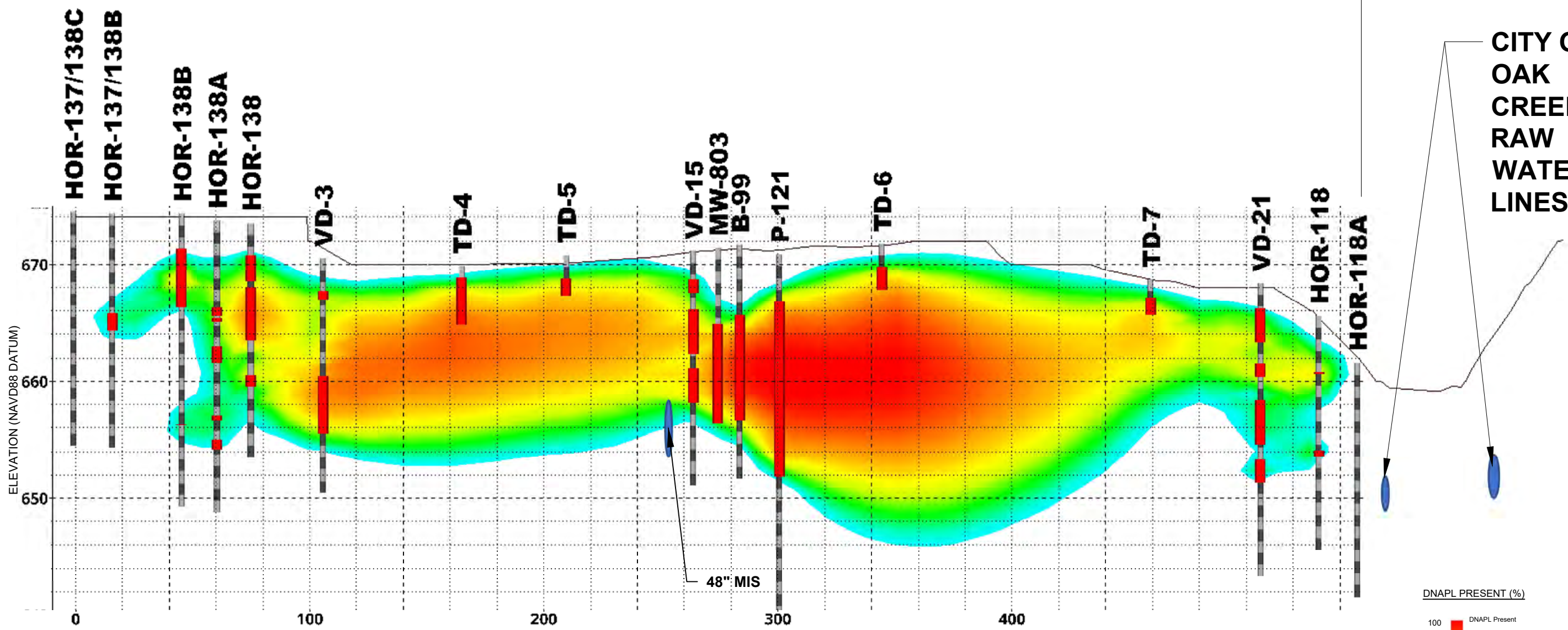
TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE			
CROSS SECTION B - B'			
LOCATION: OAK CREEK, WISCONSIN			
	CHECKED	MRN	FIGURE: <b>10</b>
	DRAFTED	JRD	
	PROJECT	117-2201512	
	DATE	02/09/2024	



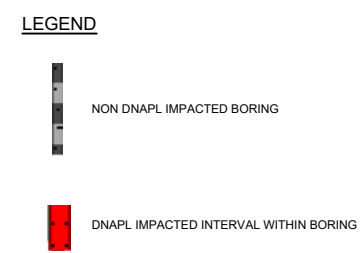
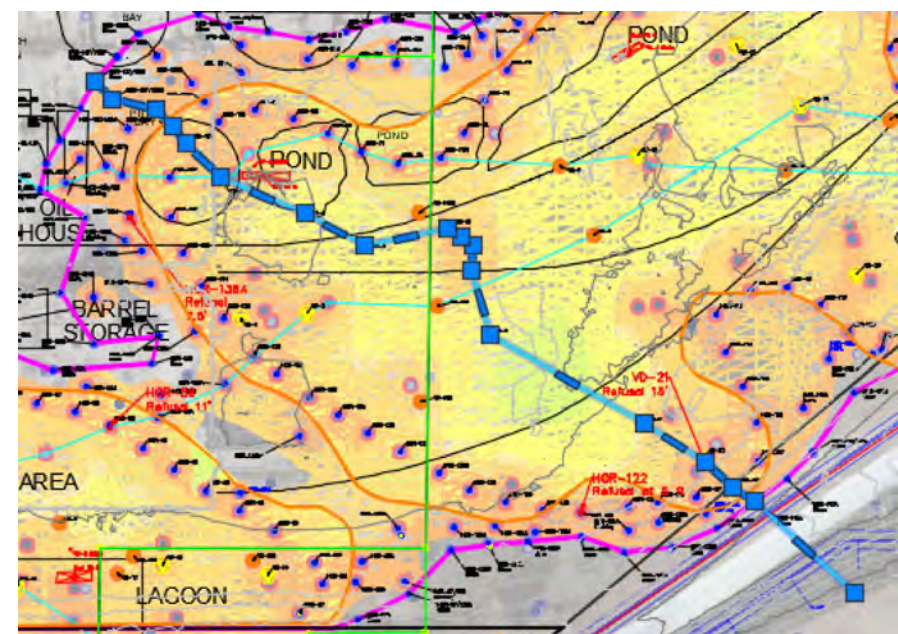
C

C'

AREA 4

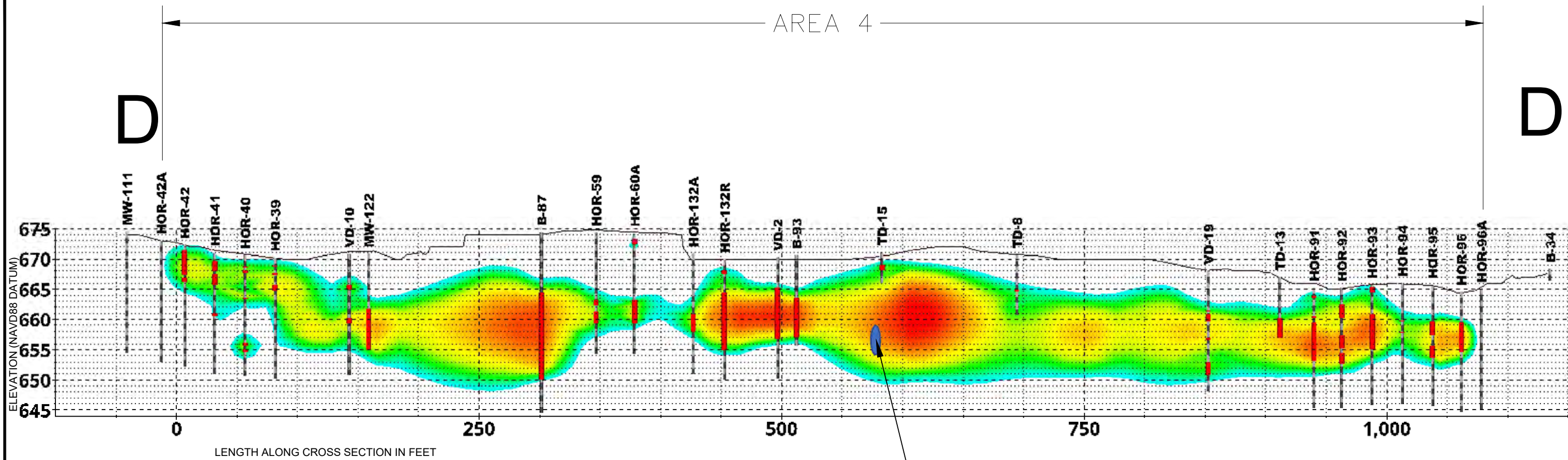


CITY OF OAK CREEK RAW WATER LINES

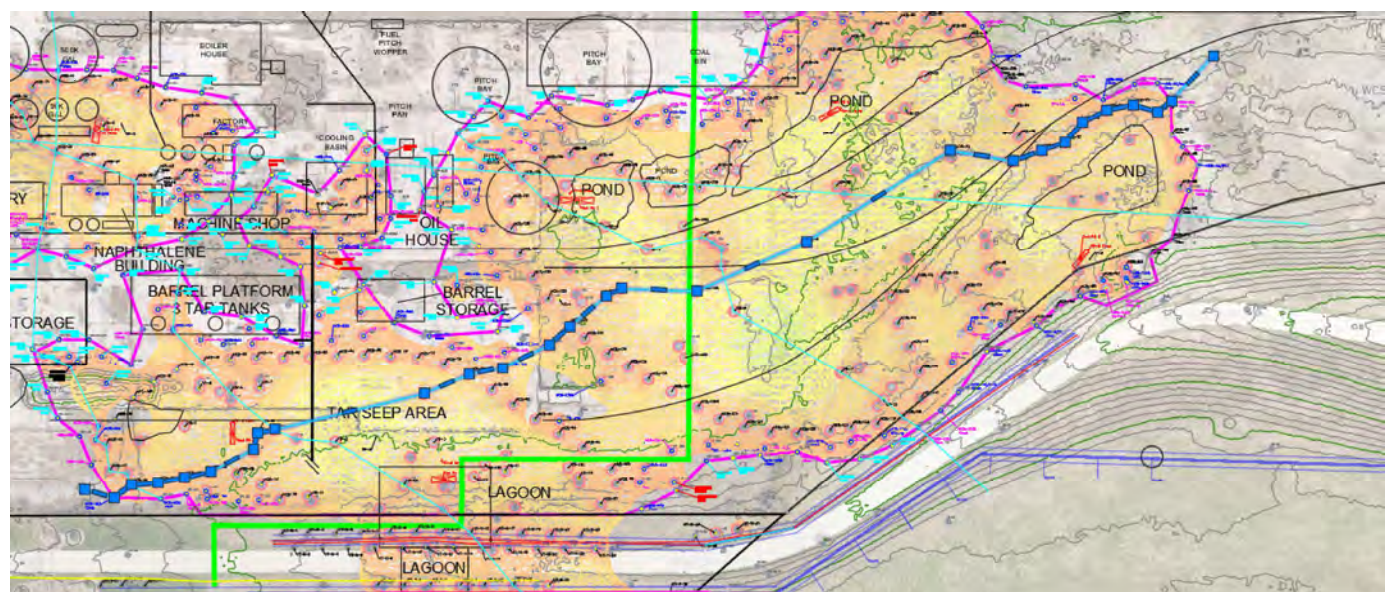
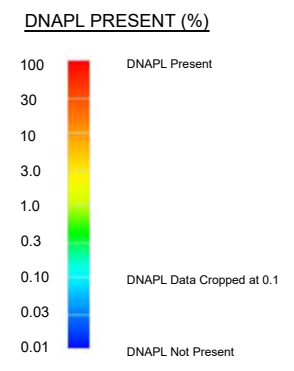


TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE		
CROSS SECTION C - C'		
LOCATION: OAK CREEK, WISCONSIN		
	CHECKED: MRN	FIGURE: 11
	DRAFTED: JRD	
	PROJECT: 117-2201512	
	DATE: 02/09/2024	





48" MIS



CROSS SECTION LOCATION MAP  
NOT TO SCALE



HORIZONTAL SCALE IN FEET  
5X VERTICAL EXAGGERATION

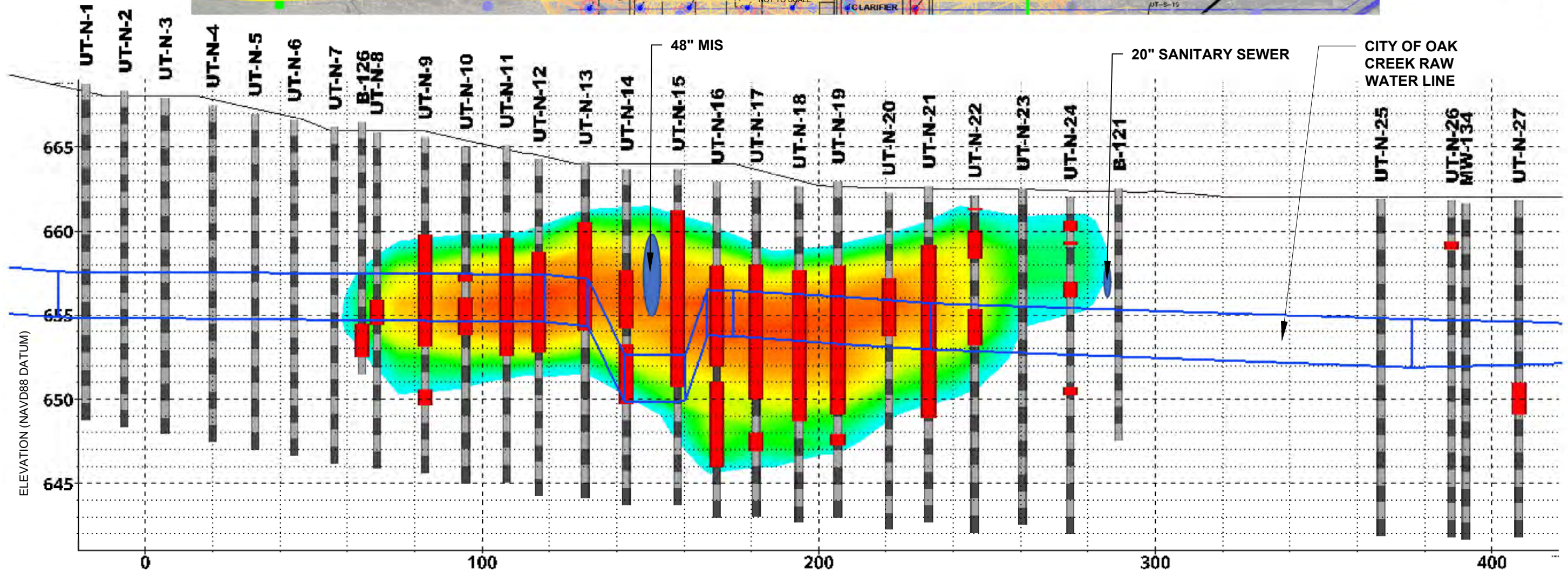
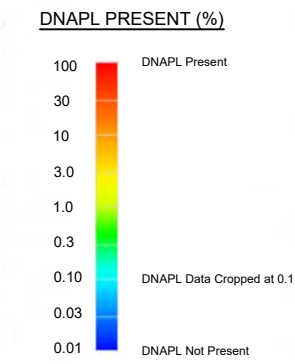
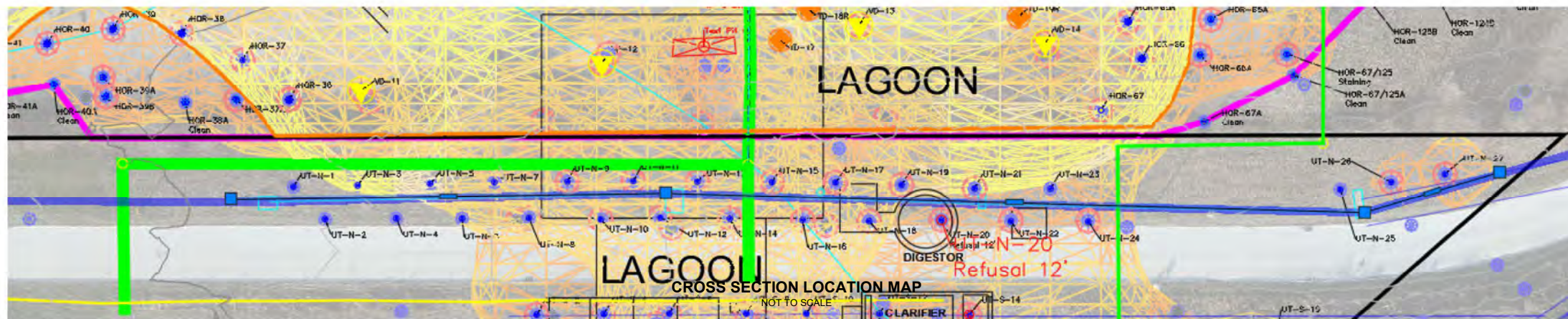
TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE		
CROSS SECTION D - D'		
LOCATION: OAK CREEK, WISCONSIN		
	CHECKED: MRN	FIGURE: 12
	DRAFTED: JRD	
	PROJECT: 117-2201512	
	DATE: 02/09/2024	



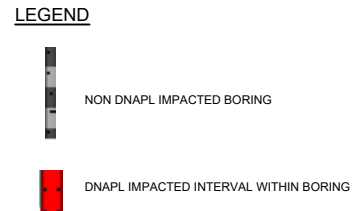




# North Pipe Cross Section Looking North



LENGTH ALONG CROSS SECTION IN FEET

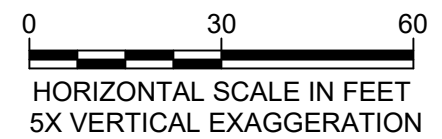
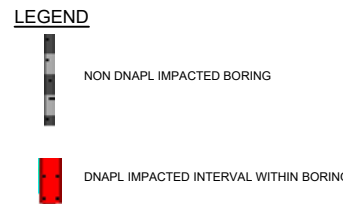
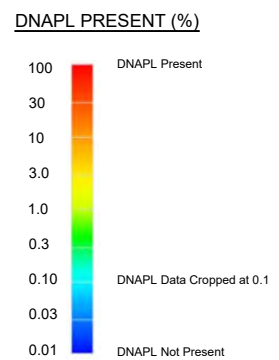
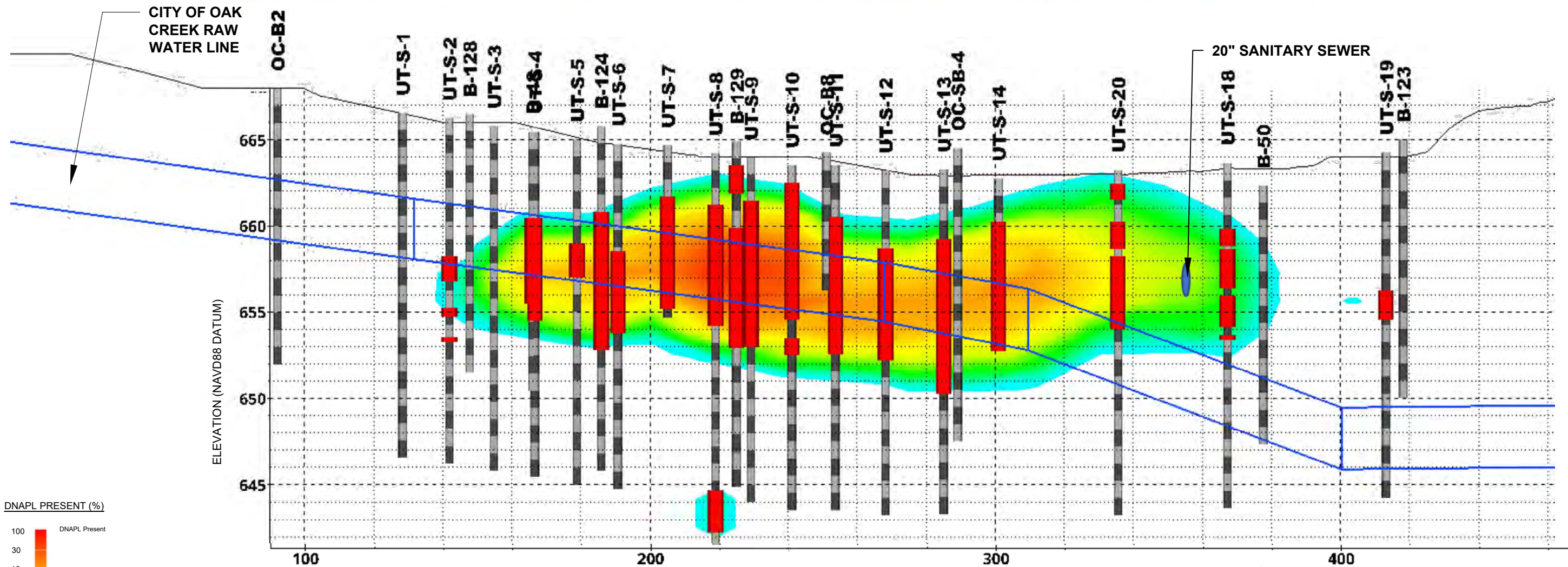
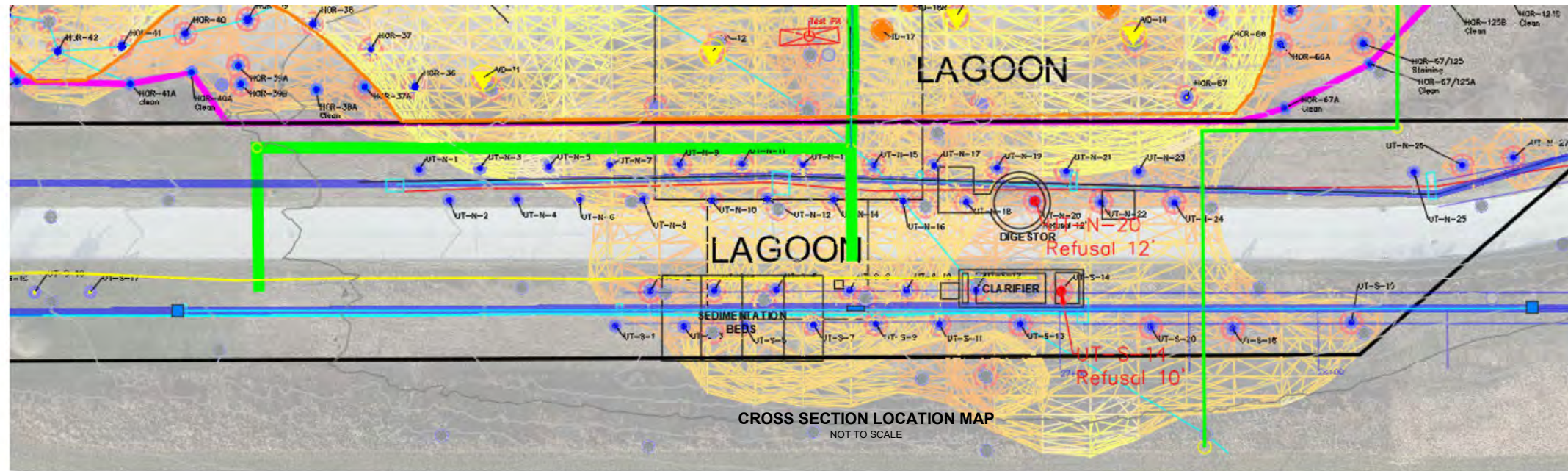


TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE  
NORTH PIPE CROSS SECTION LOOKING NORTH  
CROSS SECTION F - F'

LOCATION: OAK CREEK, WISCONSIN

CHECKED	MRN	FIGURE: <b>14</b>
DRAFTED	JRD	
PROJECT	117-2201512	
DATE	02/09/2024	





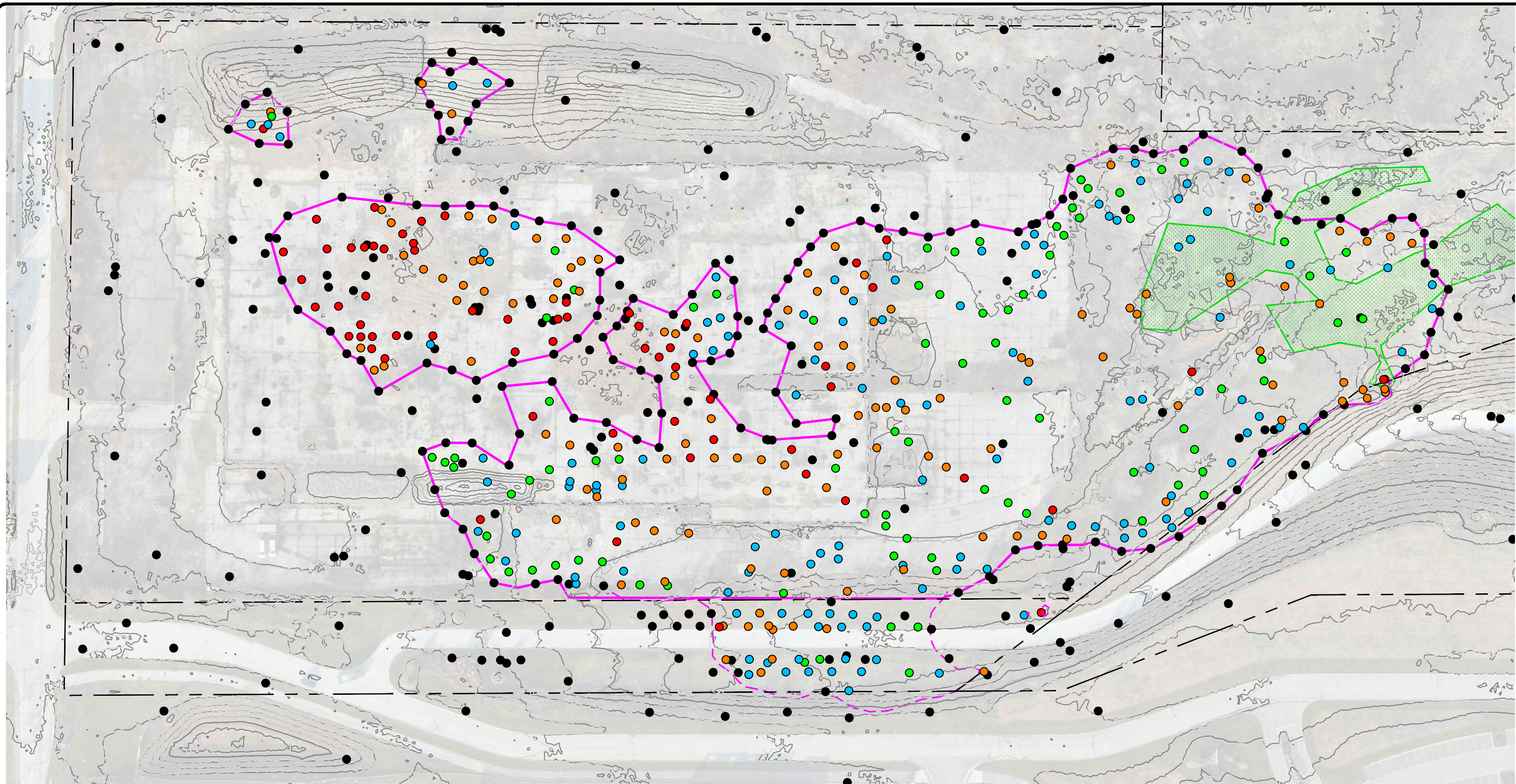
TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE  
SOUTH PIPE CROSS SECTION LOOKING NORTH  
CROSS SECTION G - G'

LOCATION: OAK CREEK, WISCONSIN

CHECKED: MRN  
DRAFTED: JRD  
PROJECT: 117-2201512  
DATE: 02/09/2024

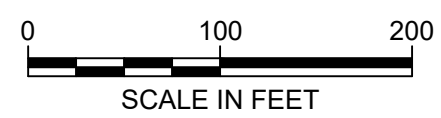
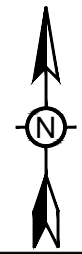
FIGURE: 15





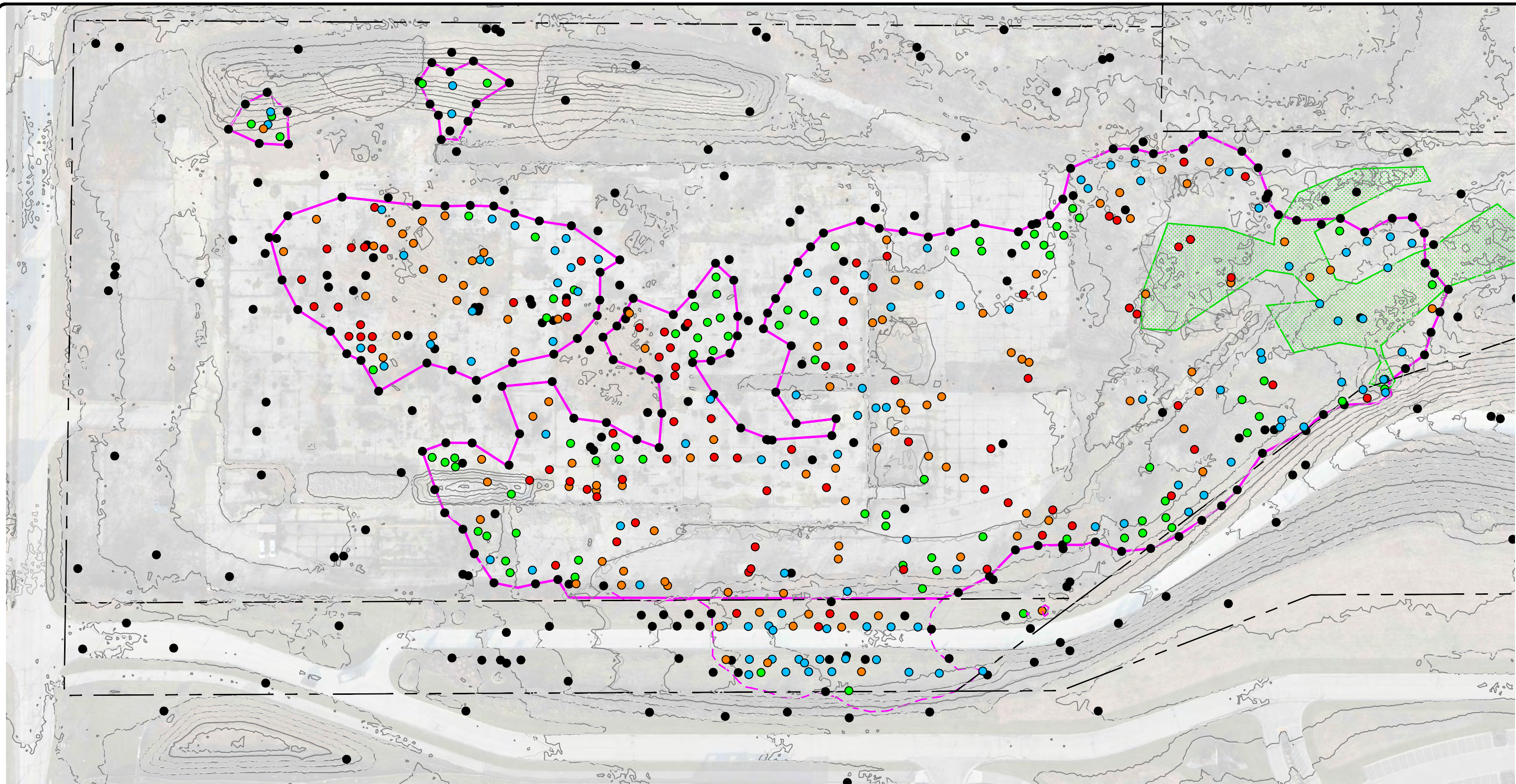
**LEGEND**

- TOPOGRAPHIC MAJOR CONTOURS (10 FT)
  - TOPOGRAPHIC MINOR CONTOURS (2 FT)
  - LIMITS OF DNAPL-IMPACTED SOIL (EVS MODEL, INCLUDING 2023 PDI DATA) - CONNELL PROPERTY
  - LIMITS OF DNAPL-IMPACTED SOIL (EVS MODEL, INCLUDING 2023 PDI DATA) - UTILITY CORRIDOR
  - PROPERTY LINES
  - NO DNAPL ENCOUNTERED
  - ⊕ MONITORING WELL
  - ▨ CURRENT DELINEATED WETLAND
- 
- DEPTH TO TOP OF DNAPL
- 0.3-2.0 FT
  - 2.1-5.0 FT
  - 5.1-10.0 FT
  - OVER 10.0 FT



TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE			
DEPTH TO TOP OF DNAPL			
LOCATION: OAK CREEK, WISCONSIN			
	CHECKED	MRN	FIGURE: <b>16</b>
	DRAFTED	JRD	
	PROJECT	117-2201512	
	DATE	02/09/2024	



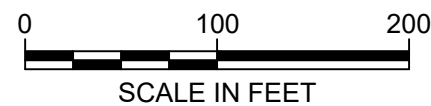
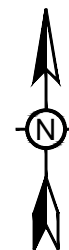


**LEGEND**

- TOPOGRAPHIC MAJOR CONTOURS (10 FT)
- TOPOGRAPHIC MINOR CONTOURS (2 FT)
- LIMITS OF DNAPL-IMPACTED SOIL (EVS MODEL, INCLUDING 2023 PDI DATA) - CONNELL PROPERTY
- LIMITS OF DNAPL-IMPACTED SOIL (EVS MODEL, INCLUDING 2023 PDI DATA) - UTILITY CORRIDOR
- PROPERTY LINES
- NO DNAPL ENCOUNTERED
- MONITORING WELL
- CURRENT DELINEATED WETLAND

**DEPTH TO BOTTOM OF DNAPL**

- 0.0-8.0 FT
- 8.1-12.0 FT
- 12.1-15.0 FT
- OVER 15.0 FT



TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE

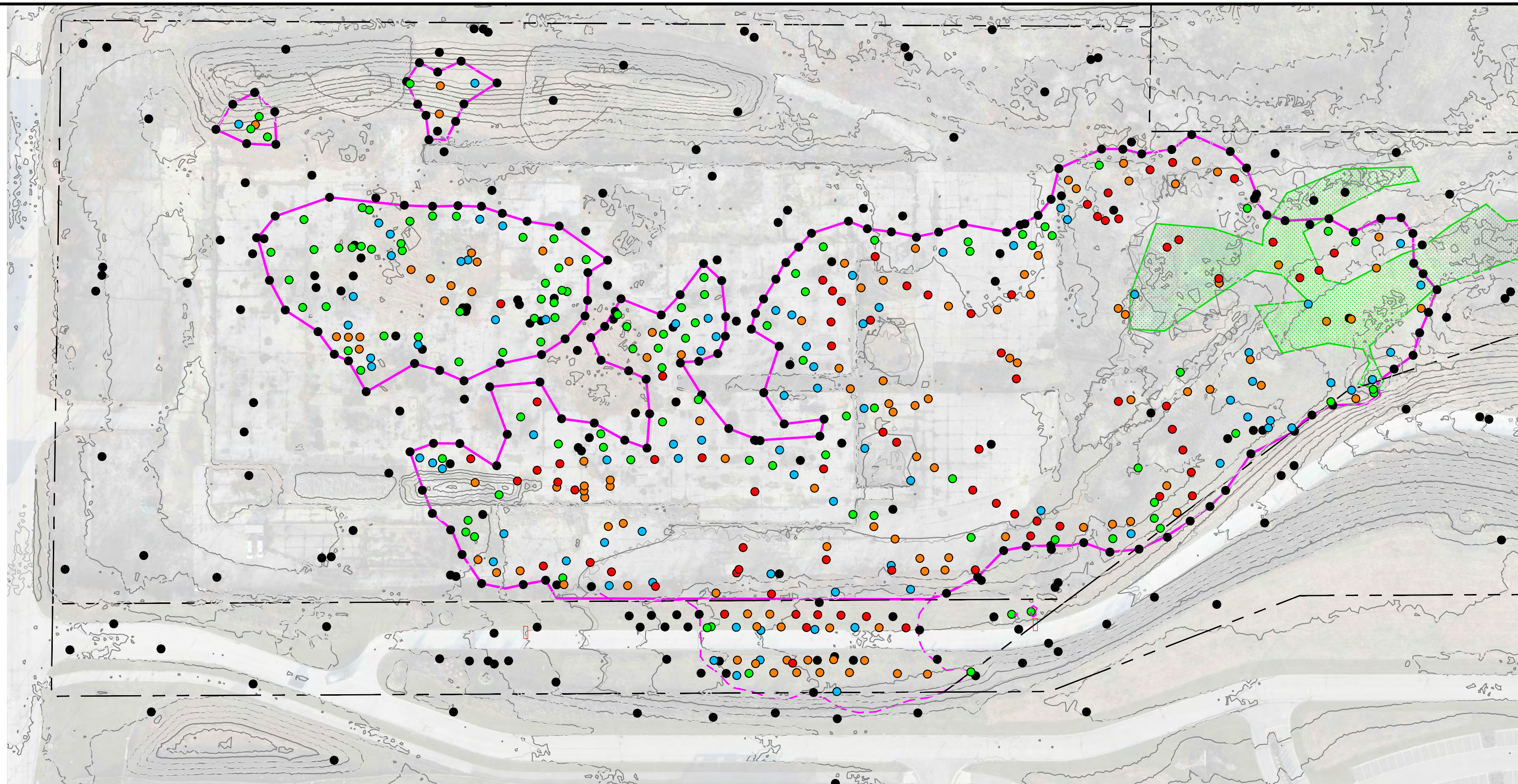
DEPTH TO BOTTOM OF DNAPL

LOCATION: OAK CREEK, WISCONSIN



CHECKED	MRN	FIGURE: <b>17</b>
DRAFTED	JRD	
PROJECT	117-2201512	
DATE	02/09/2024	



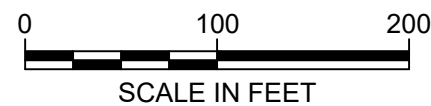
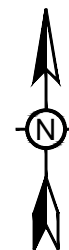


**LEGEND**

- TOPOGRAPHIC MAJOR CONTOURS (10 FT)
- TOPOGRAPHIC MINOR CONTOURS (2 FT)
- LIMITS OF DNAPL-IMPACTED SOIL (EVS MODEL, INCLUDING 2023 PDI DATA) - CONNELL PROPERTY
- LIMITS OF DNAPL-IMPACTED SOIL (EVS MODEL, INCLUDING 2023 PDI DATA) - UTILITY CORRIDOR
- PROPERTY LINES
- NO DNAPL ENCOUNTERED
- MONITORING WELL
- CURRENT DELINEATED WETLAND

**DNAPL THICKNESS**

- 0.1-2.0 FT
- 2.1-5.0 FT
- 5.1-10.0 FT
- OVER 10.0 FT



TITLE: FORMER KOPPERS TAR PLANT AND WABASH ALLOYS SITE  
ISS TREATMENT THICKNESS

LOCATION: OAK CREEK, WISCONSIN



CHECKED	MRN	FIGURE: <b>18</b>
DRAFTED	JRD	
PROJECT	117-2201512	
DATE	02/09/2024	



## TABLES

**TABLE 1**  
**NON-DNAPL IMPACTED AND DNAPL-IMPACTED SOIL VOLUMES - CONNELL PROPERTY**  
**FORMER KOPPERS TAR PLANT AND WABASH ALLOYS FACILITY**  
**OAK CREEK, WISCONSIN**

Area	Area (SF)	Avg. Depth DNAPL Bottom (FT)	Avg. Depth DNAPL Top (FT)	Volume of DNAPL-Impacted Soil (CF)	Volume of DNAPL-Impacted Soil (CY) <sup>1</sup>	Volume of Soil Overburden (CY)
1	2,400	8.5	5.2	7,920	293	462
2	4,200	9.6	4.9	20,076	744	754
3	53,000	13.3	10.2	164,300	6,085	20,022
4	304,000	11.7	5.2	1,966,880	72,847	58,886
<b>Total</b>	<b>363,600</b>			<b>2,159,176</b>	<b>79,969</b>	<b>80,125</b>

**NOTES:**

Avg. = Average

CF = Cubic Feet

CY = Cubic Yards

DNAPL = Dense Non-Aqueous Phase Liquid

FT = Feet

SF = Square Feet

1. Volume of DNAPL-impacted soil on the Connell Property. The Remedial Design Report ("RDR") will present a determination of the specific areas and depths requiring ISS on the Connell Property, and additionally account for PCB-impacted soil removal to be conducted by Connell prior to implementation of ISS by Beazer to address DNAPL-impacted soil. The RDR will present a determination of the specific area and depth of DNAPL-impacted soil and a remedial approach for the MIS.

**TABLE 2**  
**NON-DNAPL IMPACTED AND DNAPL-IMPACTED SOIL EXCAVATION VOLUMES - CITY UTILITY CORRIDOR WATER MAINS**  
**FORMER KOPPERS TAR PLANT AND WABASH ALLOYS FACILITY**  
**OAK CREEK, WISCONSIN**

**City of Oak Creek Utility Corridor Lot 1**

Area	Length of DNAPL Area (FT)	Width of Utility Excavation (FT)	Excavation Area (SF)	Avg. Depth of Excavation (FT)	Avg. Depth of DNAPL Top (FT)	Volume of Pipe (CF)	Volume of Excavated DNAPL Soil (CY) <sup>1</sup>	Volume of Overburden Soil (CY)
North Water Main	230	13.1	3,009	12.2	5.4	1,718	689	606
South Water Main	240	13.8	3,300	10.6	4.0	2,652	706	486

**Notes**

CF = Cubic Feet

CY = Cubic Yards

FT = Feet

in. - inches

NA = Not Applicable

O.D. = Outside Diameter

SF = Square Feet

1. Volume of DNAPL-impacted soil along the north and south water mains above and within a lateral distance of no less than 5 feet on either side of each water main.

The RDR will present a determination of the DNAPL-impacted soil to be removed from the vicinity of the water lines in the City Utility Corridor.

Water Main (UT)	Pipe ID (in.)	Nominal Pipe OD (in)	Length (ft)	Volume (CF)
North	30	37	230	1,718
South	36	45	240	2,652

## **APPENDICES (CD)**

**Appendix A.** Soil Boring Data Used in the EVS DNAPL Delineation Model

**Appendix B.** Soil Boring Logs (WDNR Form 4400-122)

**Appendix C.** Boring Photographs

**Appendix D.** Borehole Abandonment Forms (WDNR 3300-005)