From: Beggs, Tauren R - DNR
Sent: Thursday, April 11, 2019 4:17 PM
To: 'gbuckley@two-rivers.org'
Cc: 'Stuart Boerst'
Subject: Call to Discuss MW-2 LNAPL - Former Kahlenburg / Thermo Fisher Area
Attachments: MW-2 LNAPL Area.pdf

Hi Greg,

Looking to set up a call with you and possibly Stuart as well to discuss the MW-2 petroleum light non-aqueous phase liquid (LNAPL) area. The most recent site investigation report for the Thermo Fisher property was submitted with a fee for DNR review. The DNR Closure Committee and me (the Project Manager) review the site investigation as part of this fee review. There is some additional work that Thermo needs to do in regard to the investigation of the chlorinated volatile organic compounds (CVOCs).

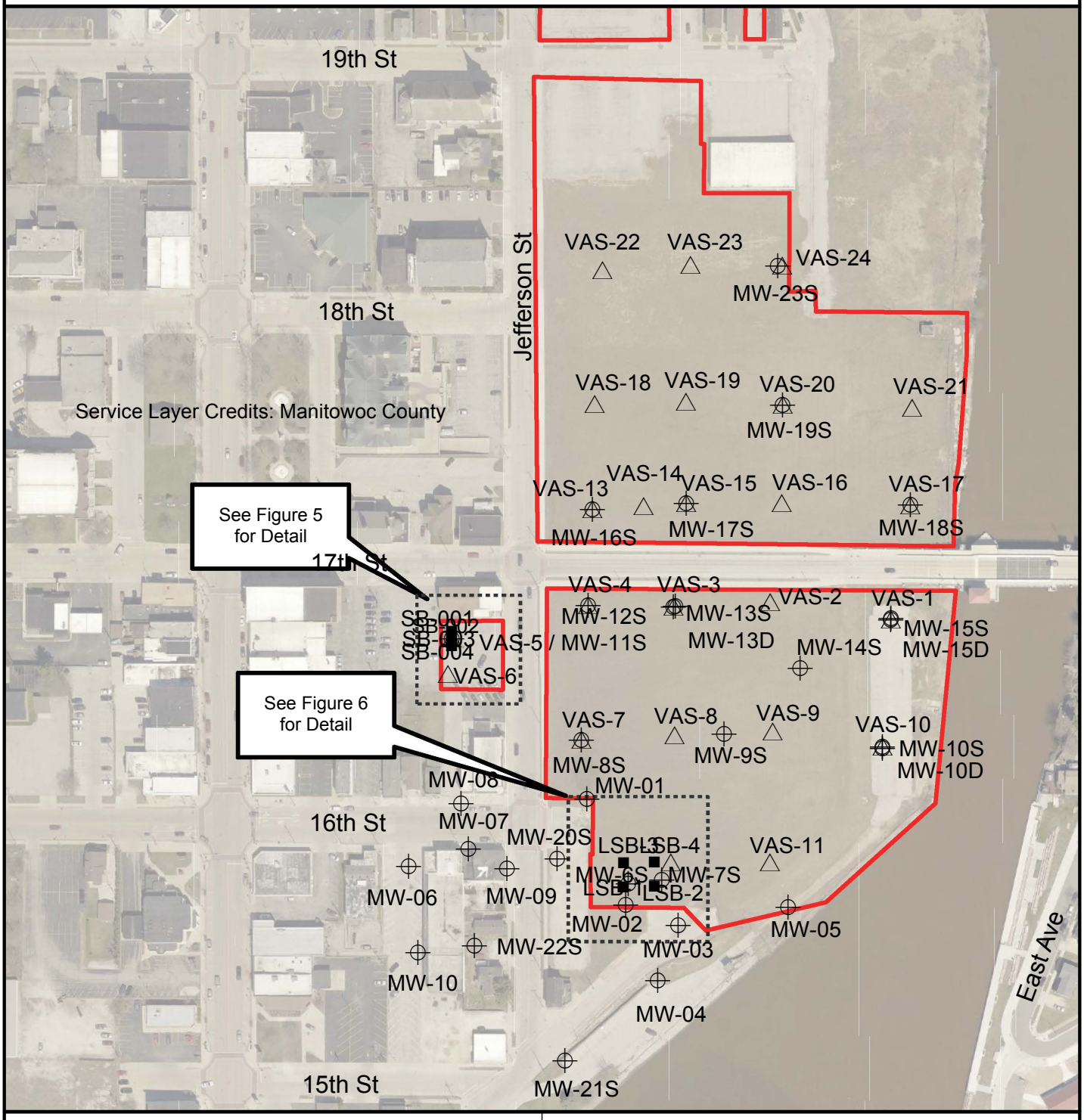
As part of the investigation conducted by ERM on behalf of Thermo Fisher, DNR required additional investigation on the Thermo Fisher property for potential petroleum sources to determine if the LNAPL found in MW-2 was a result of former activities, USTs, etc. on the Thermo property. Additional work was completed by ERM including a ground penetrating radar (GPR) survey to see if there were USTs and/or any other underground detections/anomalies that could be a potential indicator of a contaminant source and follow up soil and groundwater sampling for petroleum compounds based on the survey. No petroleum compounds related to a diesel-type LNAPL have been detected in soil borings or groundwater as part of that additional work north of MW-2. No petroleum compounds have been detected in soil borings or permanent monitoring wells up-gradient or downgradient of MW-2 in the locations sampled to date. I have attached some applicable figures as a reference to this area. There are some concerns still regarding whether this LNAPL found is minor in degree and extent or a larger issue. The area that has not been assessed is south of MW-2 on the former Kahlenburg property. Based on what is known there is a small amount of LNAPL observed in two separate monitoring events. I have had a conversation with ERM about this LNAPL area and would like to discuss this area with the City as well.

Please let me know a time that would work for you. I am pretty free tomorrow and early next week.

Thanks,

Tauren R. Beggs
Hydrogeologist & Northeast Region Land Recycling Expert
Remediation and Redevelopment Program
Wisconsin Department of Natural Resources
2984 Shawano Ave
Green Bay, WI 54313
Phone: (920) 662-5178
Tauren.Beggs@wisconsin.gov

INVESTIGATION BORING LOCATION MAP



Legend

- △ Vertical Aquifer Sample Locations
- ⊕ Monitoring Well Locations
- ■ Soil Boring Locations
- ▭ Property Boundary

N

0 280 560 Feet

Figure 4

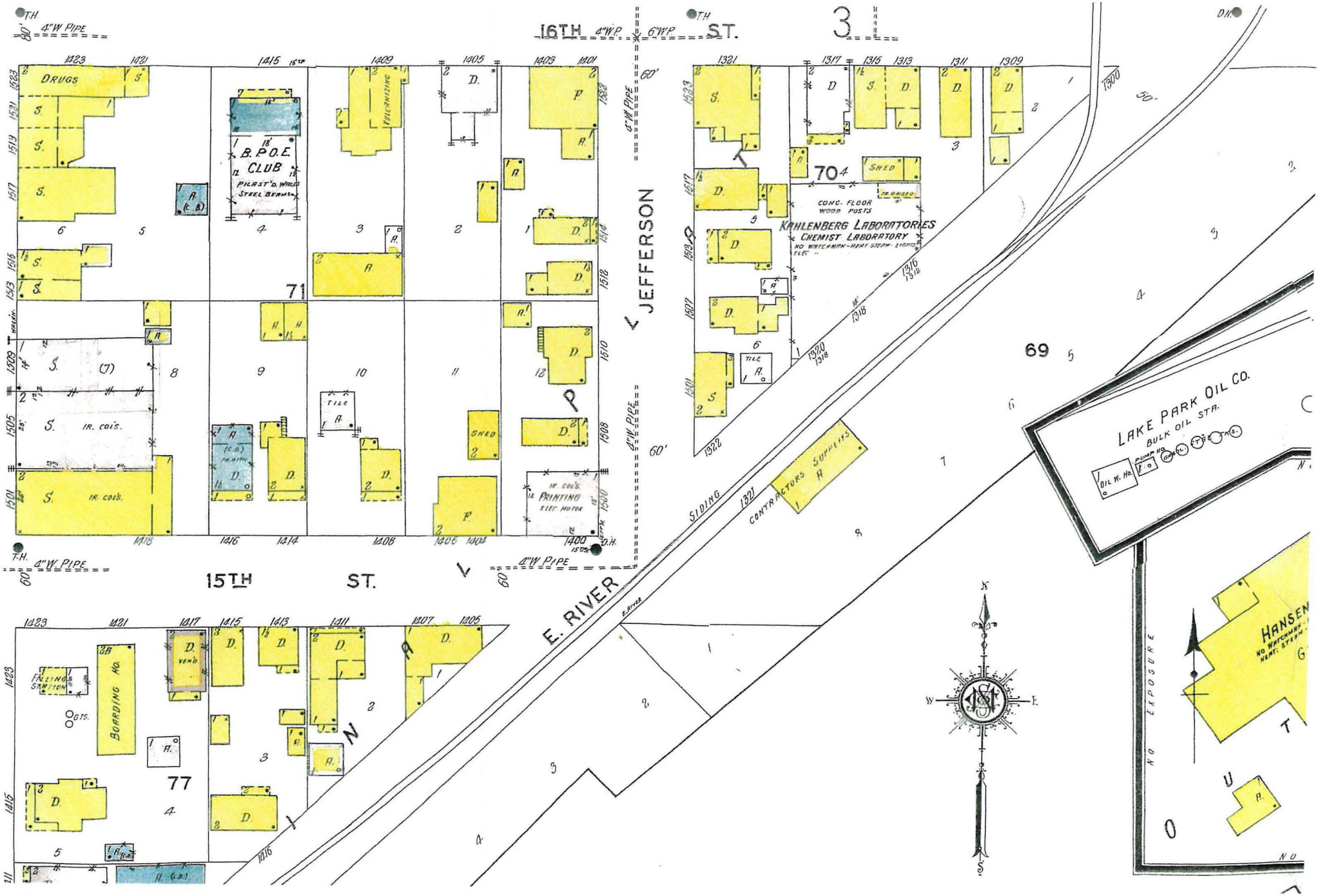
Former Hamilton Industries
1316 18th Street
Two Rivers, WI

This information is for environmental review purposes only.

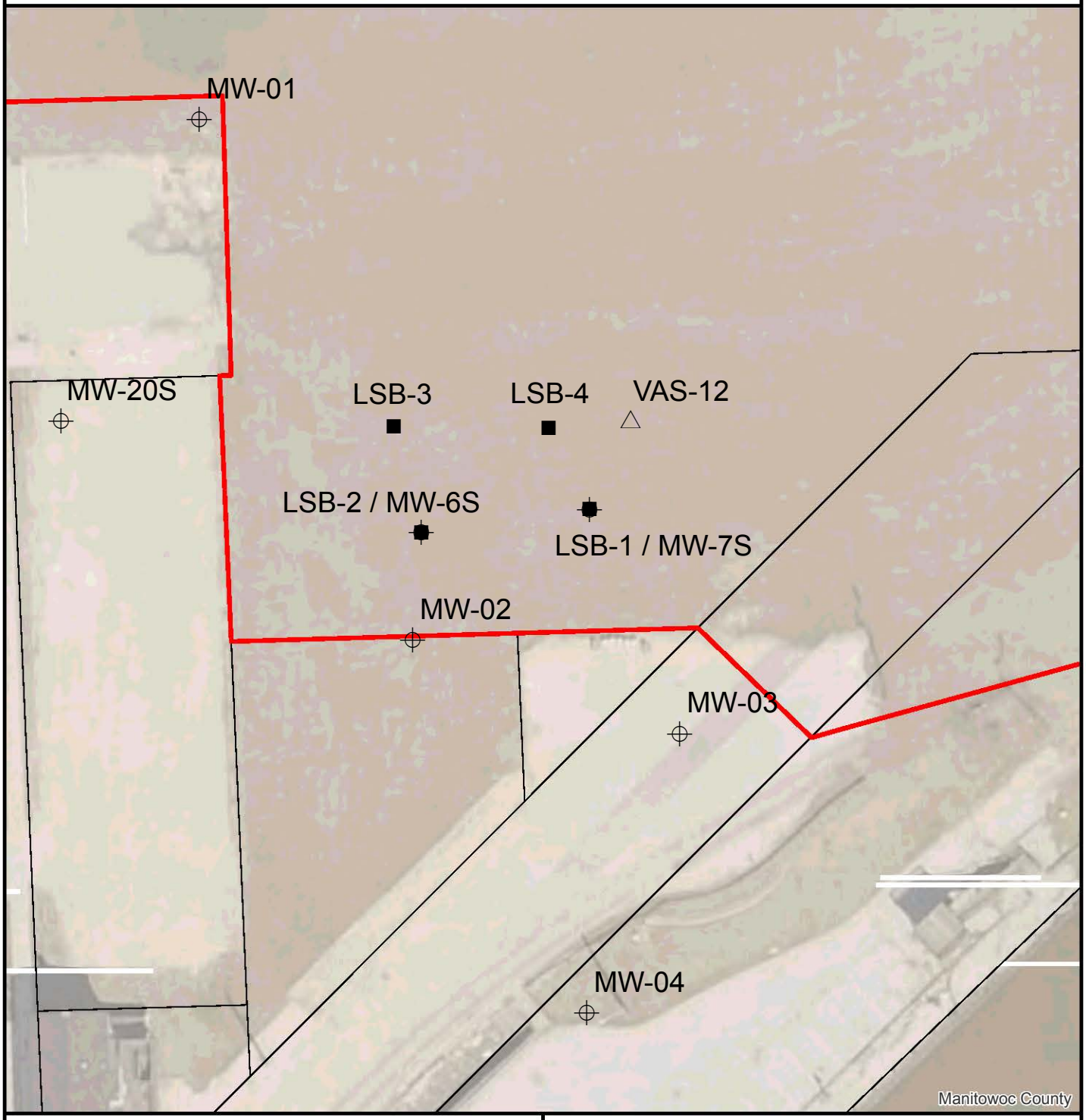
ERM

Basemap: Manitowoc County Orthophoto, 2017.

P:\Projects\0383990 Thermo Fisher Scientific, Inc Two Rivers Further Investiga.DC\Deliverables\TWORIVERS GIS\Figure 4 Investigation Boring Location Map.mxd | REV: 01/21/2019 | SCALE: 1:2,500 | DRWN BY: GIS


16TH ST.
15TH ST.
JEFFERSON
E. RIVER
B.P.O.E. CLUB
PILAST'D. W.I. STEEL BEAMS
KAHLENBERG LABORATORIES
CHEMIST LABORATORY
CONC. FLOOR WOOD POSTS
LAKE PARK OIL CO.
BULK OIL STA.
CONTRACTORS SUPPLIES
SIDING
DRUGS
PRINTING
BOARDING HO.
FILLING STATION
SHED
TILE
NO EXPOSURE
4"W PIPE
6"W.P.
71
70
69
77

LNAPL INVESTIGATION AREA



Legend

Investigation_Points

- Vertical Aquifer Sample Location
- Monitoring Well Location
- LNAPL Investigation Boring
- Property Boundary

0 100 Feet

N

Figure 6

Former Hamilton Industries
1316 18th Street
Two Rivers, Wisconsin

This information is for environmental review purposes only.

ERM

Basemap: Manitowoc County Orthophoto, 2017

P:\Projects\0383990 Thermo Fisher Scientific, Inc Two Rivers Further Investiga.DC\Deliverables\TWORIVERS GIS\Figure 6 LNAPL Area Focus Map.mxd | REV: 01/25/2019 | SCALE: 1:500 | DRN BY: GIS

GROUND PENETRATING RADAR SYSTEMS, INC.

EXPERTS IN GPR

August 27, 2017

ERM
Attn: Carl B. Stay
700 W. Virginia St. Suite 601
Milwaukee, WI 53204
Phone: 414-977-4709
Email: carl.stay@erm.com

Re: GPR Investigation for Underground Storage Tanks
Site: Jefferson and 16th Street in Two Rivers, WI

We appreciate the opportunity to provide this summary report for our work completed on 8/22/17 at the above referenced site.

Purpose

The purpose for the ground penetrating radar(GPR) and EMP-400 investigation was to locate any possible Utilities in area of soil borings as well as possible Underground Storage Tank(s). GPRS was informed of the areas of concern and focus. GPRS was to scan to locate any other significant anomalies such as buried metal, tires, and other anomalies that could be buried at the site.

Equipment:

- **Ground Penetrating Radar (GPR), Manufacturer: GSSI, Model: SIR-4000 processing unit with 400 MHz antenna.** GPR works by sending pulses of energy into a material and recording the strength and the time require for the return of the reflected signal. Reflections are produced when the energy pulses enter into a material with different electrical conduction properties from the material it left. The strength of the reflection is determined by the contrast in conductivity between the two materials. The total depth achieved can be as much as 8' with this antenna but can vary widely depending on the dielectric properties of the materials.
- **RD7000 pipe locator, Manufacturer: Radiodetection.** The RD7000 can detect the electromagnetic fields from live power or radio frequency signals. It can also be used in conjunction with a trasmitter to connect directly to accessible, metallic pipes, risers, or tracer wires. A tone is sent through the pipe or tracer wire at a specific frequency which can then be detected by the receiver.
- **The Profiler EMP-400 GSSI EMI (Profiler**) - EMI stands for Electro Magnetic Induction, by which it creates a primary magnetic field and having this current flow in the subsurface, will produce a secondary magnetic field in the sub-surface.

Process

GPR/*RD Investigation*: Our process involves using Ground Penetrating Radar (GPR) and RD7000 within the scan area. Our process begins with locating utilities using RD7000 equipment. If any utilities are present above ground, a tracer signal will be sent along them to attempt to follow them underground using RD7000. Upon location, any utilities will be painted and/or flagged directly on the ground surface with their approximate depths (if requested); this is our typical and standard output. GPR uses electromagnetic pulses through the ground that reflect back to the antenna at different speeds off of

different materials. GPRS, Inc. used a 400 MHz antenna with the SIR-4000 processing unit manufactured by GSSI. These represent the latest in GPR utility locating technology. With the GPR we scan in a grid formation and mark the center of any anomalies such as utilities, underground structures, excavation sites, trenches, underground storage tanks, voids, and other significant anomalies.

EMI Profiler Investigation: The site was scanned with a GSSI Profiler (electromanetic induction unit). This unit is menuavered across the subject property in straight lines and is used primarily for finding UST's, buried concrete, and other buried metals. The EMI instrument transmits a primary magnetic field, which induces an electrical current in the earth. The current in the earth produces a secndary magnetic field. The characteristics of the secondary magnetic field indicates the conductivity of the earth. The EMI depth range is 0-3 meters. Metals items such as fences, cars, etc can have a negitive effect of the results.

GPR/RD Findings

The area of GPR/RD and EMI Profiler investigation was approximately 1 acres in size and 7 locations. The site contained grassy and gravel surfaces. The GPR equipment was unable to scan within 3' of obstrucitons and overgrown shrubbery.

The GPR equipment was able to penetrate up to 4-6' in depth across the site. The GPR equipment did detect a significant anomalies near one of the soil boring locations and shown in the EMI data below. This was not confirmed as a Underground Storage Tank as it seems to be continuous through a large section of the site. Findings were painted on the surface.

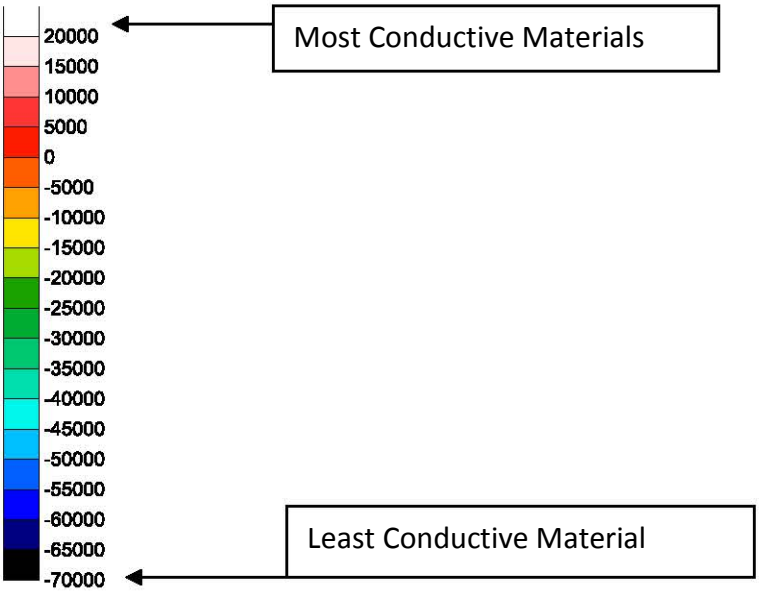
EMI Profiler Findings:

The EMI profiler collects data on two (2) frequencies for the most thorough survey. The EMI Profiler equipment detected two long rectangular findings that could possibly be interpreted as the trench areas in search. These are indicated on *Figure 1* of the following pages.

The following pages will further describe the findings.

EMI Profiler Findings

Key to colors below:

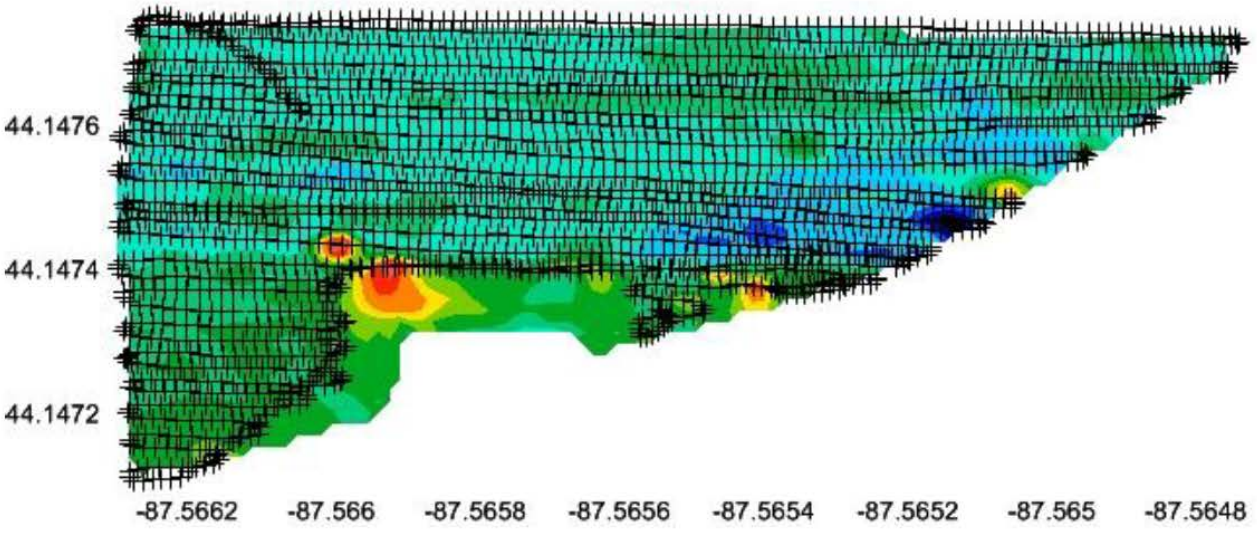


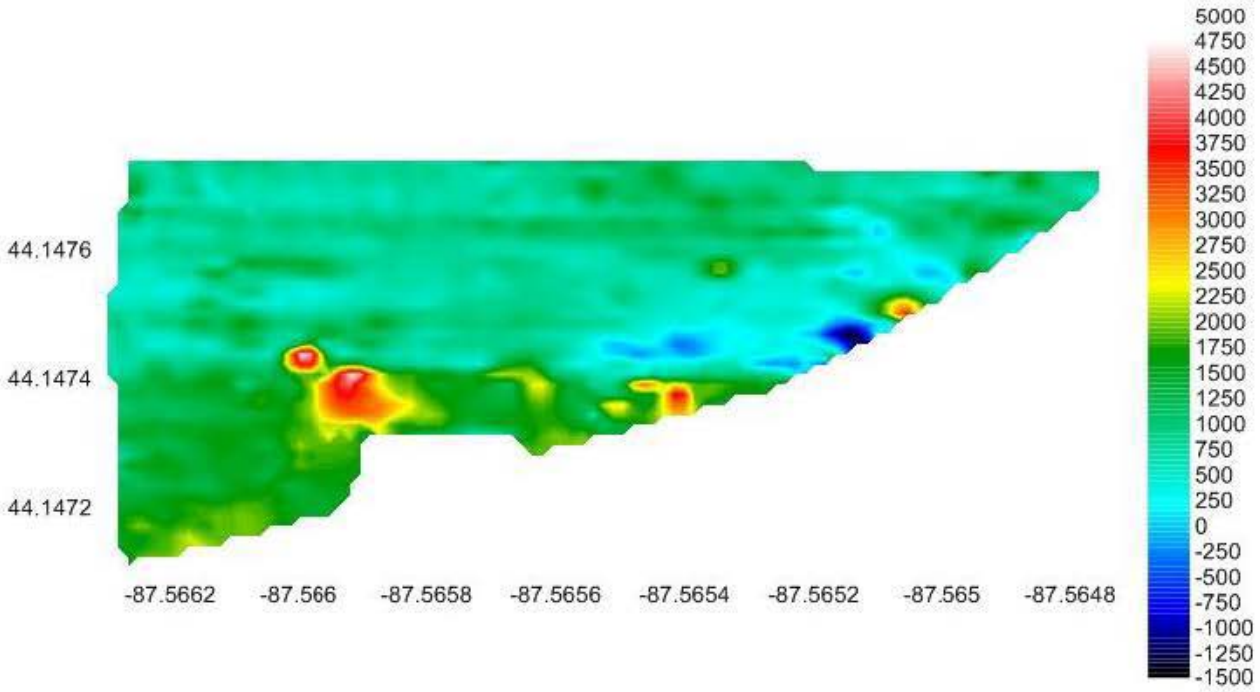
The following pages will further describe the findings.

EMI Profiler Findings

Figure 1- InPhase 5k (Metallic Features 2-3 Meters in Depth)

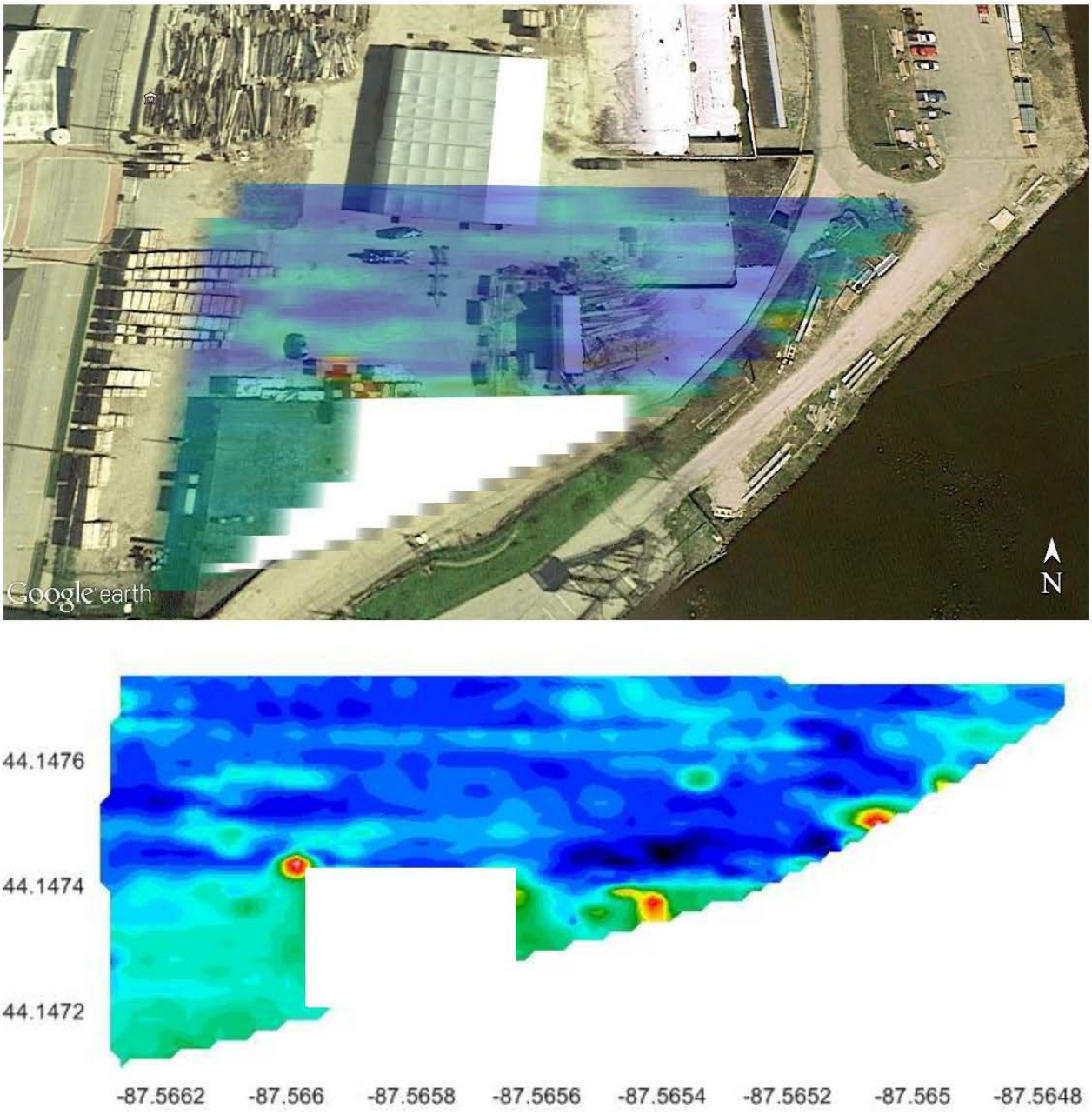
The above Google earth image contains the EMI findings from the site. This is the most up to date map that was available at time of completion. The Red arrow is pointing to a metallic finding. This could be from the existing standpipe. The white box is to clear washed data from the metal drums and fence in the area. The image below is a clearer picture of what was scanned. The black marks is the path taken in collection. The target of concern is at x 87.56599 y 44.14743 or Latitude 44° 8'50.74"N Longitude 87°33'57.58"W. The InPhase data looks at both Metallic and Non-Metallic items. On the following pages you will see the overlay and the jpeg of the data. It lists the depths that we are focusing on and the data type.




5000
4750
4500
4250
4000
3750
3500
3250
3000
2750
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
-250
-500
-750
-1000
-1250
-1500
44.1476
44.1474
44.1472
-87.5662
-87.566
-87.5658
-87.5656
-87.5654
-87.5652
-87.565
-87.5648

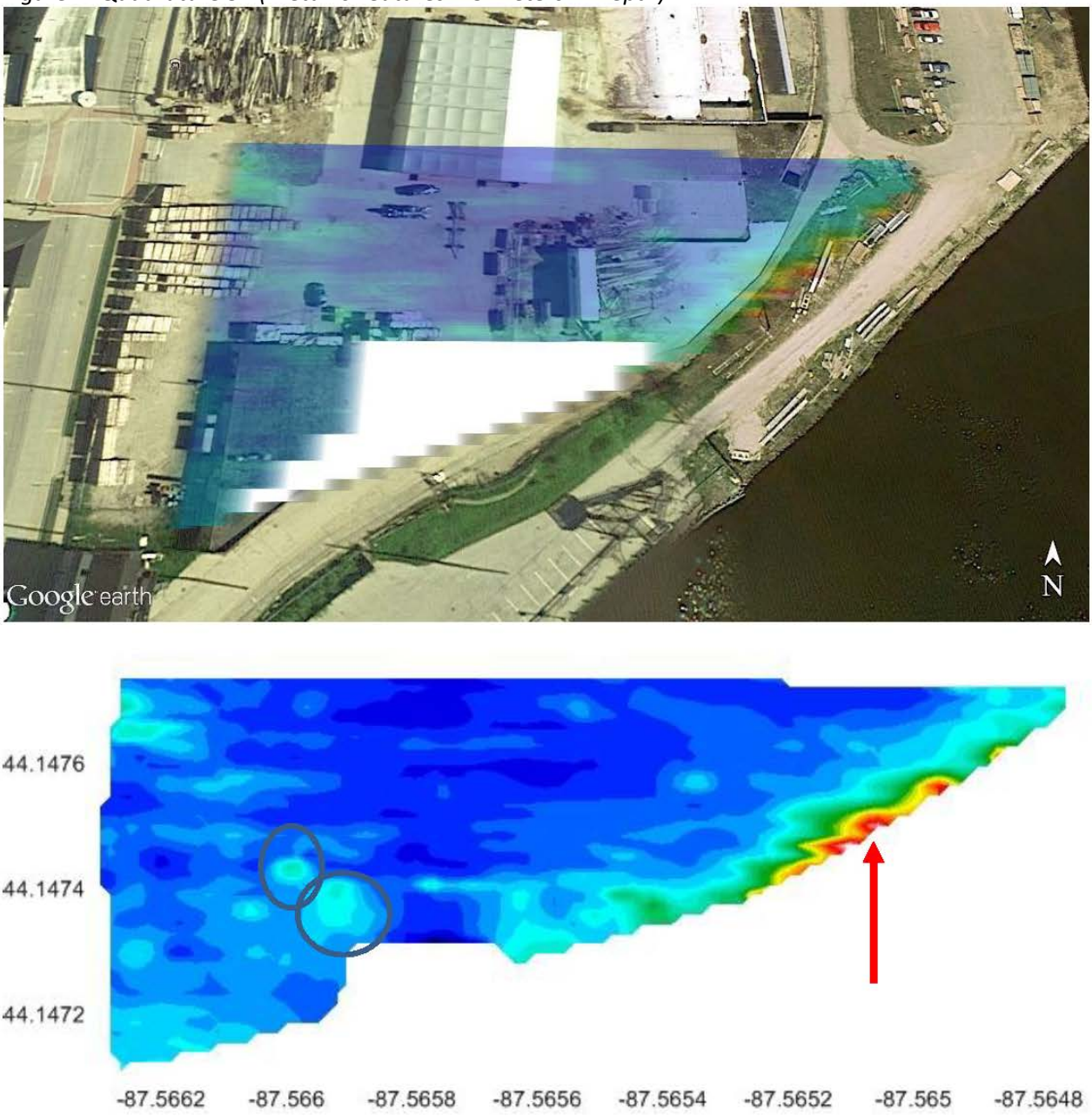
EMI Profiler Findings

Figure 2- InPhase 12k (Metallic Features 1-2 Meters in Depth)



EMI Profiler Findings

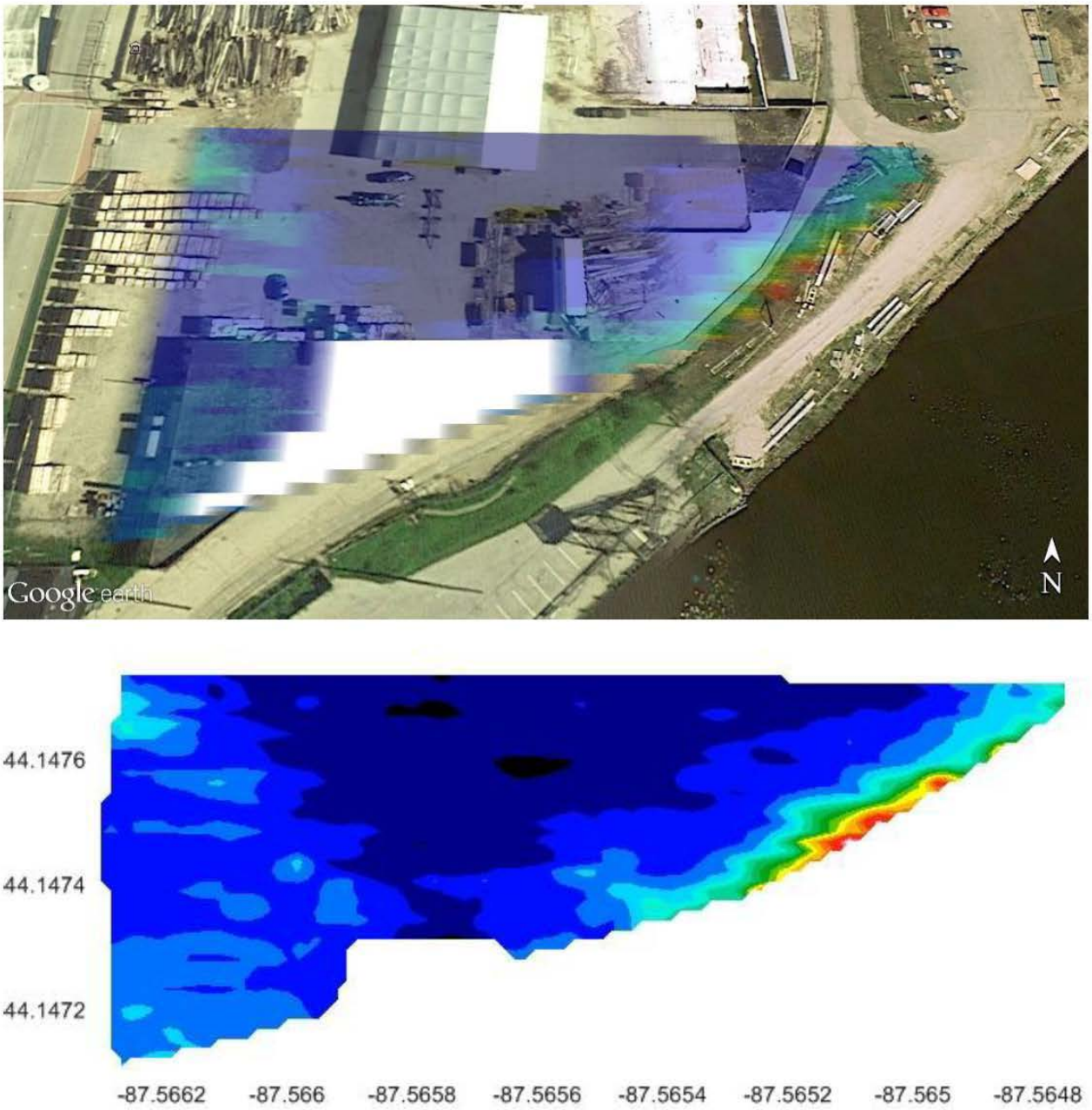
Figure 4- Quadrature 5K (Metallic Features 4-5 Meters in Depth)



The data above and below reference the quadrature files. The Quadrature files focus on Metal Targets compared to the InPhase which allows us to look at more overall targets. The arrow on the right of this data is pointing to the hot metallic item. This is believed to be the waterline that runs along the gravel road to the fire hydrant. We can see again on the left two circles that are near the areas of concern from the InPhase data. Further investigation may be needed.

EMI Profiler Findings

Figure 5- Quadrature 12K (Non-Metallic Features 1-2 Meters in Depth)



Limitations:

There were limited obstructions on site, but we did have issues with the metal objects on site with the EMI. Those consisted of large drums, fences, water line, and stand pipe. Please note that the equipment may not achieve maximum effectiveness due to soil conditions, above ground obstructions, reinforced concrete, and a variety of other factors. No subsurface investigation or equipment can provide a complete image of what lies below. Our results should always be used in conjunction with as many methods as possible including consulting existing plans and drawings, exploratory excavation or potholing.

Conclusion:

Thank you for the opportunity to serve you on this project. I hope this report has answered the questions you have regarding this site. Please note that this report was put together by a non-practicing geologist and is an interpretation by an employee trained to use this type of equipment by GSSI.

Thank you,

Glenn Zebrowski – Regional Director
Ground Penetrating Radar Systems, Inc.
Glenn.zebrowski@gprsinc.com
630-423-2787