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September 18, 2020

Ms. Sarah Rolfes
Remedial Project Manager
United States Environmental Protection Agency
77 W. Jackson Boulevard
Chicago, Illinois 60604-3590

RE: Upland Remedial Investigation Data Summary Report – Revision 0
Former WPSC Green Bay MGP, Green Bay, Wisconsin
Wisconsin Public Service Corporation
CERCLA Docket No. V-W-06-C-847, CERCLIS ID – WIN000509948

Dear Ms. Rolfes:

Please find enclosed the Upland Remedial Investigation Data Summary Report – Revision 0 for Wisconsin Public Service Corporation's (WPSC) Former Green Bay Manufactured Gas Plant (MGP) Site.

If you have any questions or may need additional information, please contact me at 414-221-2156 or via email at frank.dombrowski@wecenergygroup.com.

Sincerely,

Frank Dombrowski
Principal Environmental Consultant

Enclosures as noted

cc: Ms. Sarah Krueger, WDNR (via US Mail and email)
Ms. Cheryl Bougie, WDNR (via email)
Mr. William Fitzpatrick, WDNR (via email)
Mr. Colin Schmenk, WDNR (via emial)
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Dr. Staci Goetz, Ramboll (via email)

Intended for
WEC Business Services, LLC

Date
September 18, 2020

Project No.
1940070712

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT

FORMER GREEN BAY MANUFACTURED GAS PLANT SITE, OPERABLE UNIT 1

RAMBOLL Bright ideas. Sustainable change.

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT SITE, OPERABLE UNIT 1

Project name	**Former Green Bay Manufactured Gas Plant Site**
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Prepared by	**Brian G. Hennings, PG**
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ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order on Consent
BaP	benzo(a)pyrene
BaA	benzo(a)anthracene
bgs	below ground surface
BLRA	Baseline Risk Assessment
BRRTS	Bureau for Remediation and Redevelopment Tracking System
BTEX	benzene, toluene, ethylbenzene, xylenes
cm/s	centimeter per second
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	contaminants of concern
COPC	constituent of potential concern
cPAHs	carcinogenic PAHs
CSM	Conceptual Site Model
DNAPL	dense non-aqueous phase liquid
ERP	WDNR Environmental Repair Program
FS	Feasibility Study
ft^3	cubic feet
GBGLC	Green Bay Gas Light Company
GC	gas chromatograph(y)
IA	indoor air location
LUST	leaking underground storage tank
MGP	manufactured gas plant
Microbial Insights	Microbial Insights, Inc.
mm	millimeter
MTTD	medium temperature thermal desorption
NAPL	non-aqueous phase liquid
NELAP	National Environmental Laboratory Accreditation Program
NRT	Natural Resource Technology, Inc.
OU	operable unit
OU1	upland operable unit
OU2	sediment operable unit
PAH	polycyclic aromatic hydrocarbon
PAL	Wisconsin Preventive Action Limit
PDI	Pre-Design Investigation
PID	photoionization detector
PVOC	petroleum volatile organic compound
R^2	coefficient of determination
RA	remedial action
RAF	Risk Assessment Framework
Ramboll	O'Brien & Gere Engineers, Inc., a Ramboll company
RI	Remedial Investigation
RI/FS	Remedial Investigation / Feasibility Study

RSL	Regional Screening Level
SAA	Superfund Alternative Approach
SAS	Superfund Alternative Site
SIM	selective ion monitoring
SIP	stable isotope probing
Site	WPSC Green Bay MGP
SL	screening level
SOW	Statement of Work
SSWP	Site-Specific Work Plan
SVOC	semi-volatile organic compound
TLM	tar like material
ug/m^3	microgram per cubic meter
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VI	vapor intrusion
VIDM	Vapor Intrusion Investigation Decision Matrix
VISL	vapor intrusion screening level
VOC	volatile organic compound
WDNR	Wisconsin Department of Natural Resources
WPSC	Wisconsin Public Service Corporation

EXECUTIVE SUMMARY

O'Brien & Gere Engineers, Inc., a Ramboll company (Ramboll) has prepared this Upland Remedial Investigation Data Summary Report on behalf of Wisconsin Public Service Corporation (WPSC) for the upland operable unit (OU1) of the Green Bay Former Manufactured Gas Plant (MGP) located in Brown County, Wisconsin. The primary objective of this report is to provide the United States Environmental Protection Agency (USEPA) with results of upland Remedial Investigation (RI) data collection activities; and, discuss the nature and extent of MGP residuals present in OU1.

This report also provides preliminary discussion of the human health risks of the upland site under current conditions. Based on the habitat assessment of the site that was conducted as part of the SSWP, the upland area of the site does not provide habitat for ecological receptors and so no conceptual exposure evaluation or preliminary ecological risk evaluation was performed. A complete Baseline Risk Assessment will be provided in the RI Report when it is written. Sediment and surface water will be discussed in a separate RI report for Operable Unit 2.

Site investigation and historic soil excavation activities were completed under Wisconsin Department of Natural Resources (WDNR) oversight between 1994 and 2003 focused on identifying source areas, determining the presence of former MGP structures, with continued groundwater monitoring. The site was transferred to USEPA jurisdiction in 2008, leading up to the initiation of RI activities in 2015. Results from the RI and prior investigations are discussed in this report including soil borings, soil samples, soil vapor samples, indoor air samples, and groundwater sampling from monitoring from wells and piezometers. Routine semi-annual groundwater sampling is ongoing to evaluate the effect of source removal/soil remediation activities on water quality and natural attenuation.

Previous remedial action (RA) was completed in 2003 within the upland site in the form of soil removal and treatment, engineering and institutional controls (cap maintenance area), and long-term monitoring with the goal of meeting established criteria for natural attenuation as a final groundwater remedy. Although significant amounts of source material and impacted soils were removed or treated as part of the 2003 soil remediation effort, residual impacts remain in some locations.

As described in the Completion Report (NRT, 2014), the Site Specific Work Plan (SSWP) Revision 2, and other USEPA approved Addenda and Technical Memoranda, the media and locations that required further assessment in the RI and/or which were not fully addressed by previous work with respect to public health, welfare, or environment included the following:

- Surface and sub-surface soil exploration on and off the former MGP property to refine extent of MGP residuals and provide additional data for assessment of remedial alternatives and migration pathways
- Continued groundwater sampling to evaluate concentration trends and assess alternatives
- Vapor probe installation and indoor air sampling to assess migration pathways on and off of the former MGP property

Upland RI data collection activities were completed in accordance with the approved SSWP in December of 2016 (apart from ongoing groundwater monitoring) and a preliminary RI data summary package was submitted to USEPA for discussion on February 10, 2017. At the direction

of USEPA, discussion of upland RI activities was suspended while interim remedial activities were being completed in Sediment OU2.

Previous investigations identified oil wetted/oil-coated fill soil above native clay in upland material adjacent to the Annex building and the East River in the north parking lot area. Superfund Alternative Approach (SAA) program early removal actions occurred adjacent to the former MGP in the East and Lower Fox Rivers in 2018 and 2019, removing residual DNAPL from channel sediments and native clay, and from shoreline soils. Another early removal action is planned for OU1 near the Annex Building and the East River to address remaining NAPL and MGP residuals. A Pre-Design Investigation (PDI) Work Plan was submitted March 16, 2020 and comments from USEPA were received May 29, 2020. Some comments on the PDI related to the completeness of NAPL and MGP residual delineation in other portions of the upland site particularly south of Utility Court (southern parking area). These included the risk posed by thermally treated soil used as backfill in the 2003 remedial action.

As described in this report, the results of the RI met the objectives of the SSWP Revision 2 (NRT, 2015a/b), the subsequent VI Technical Memorandum (NRT, 2016a), and provide adequate information to assess the nature and extent of affected media to support the Baseline Risk Assessment (BLRA) and the Feasibility Study (FS) for OU1. Key results include:

- The horizontal and vertical extent of trace amounts of NAPL within clay fractures south of Utility Court is defined.
- No soil contaminants of concern (COCs) were identified in the preliminary risk assessment for industrial, commercial, or residential exposure scenarios for the thermally treated soil used as backfill in the 2003 RA areas.
- NAPL extent in the northern parking lot area is currently being evaluated as part of the PDI and Early Removal Action.
- Soil exceedances of residential and industrial SLs are present within and outside the cap maintenance area. The lateral extent of soils with such exceedances is defined. Forensic analysis of soil samples collected in October 2015 also indicate PAHs found near the edge of the Site (SB-426, HA-402, and HA-405) have sources other than the former MGP Site.
- The horizontal and vertical limit of groundwater impacts is defined. Groundwater impacts primarily occur within the shallow sand and fill material above the clay till aquitard. Review of MNA parameters from the last 8 rounds of data indicate a reducing environment is present with anaerobic degradation occurring through methanogenesis within the plume.
- Review of the trend analyses indicate stable (flat) or decreasing concentrations in all wells for benzene and naphthalene. Benzo(a)pyrene concentrations are also stable or decreasing with the exception of increasing trends at three of eighteen locations (MW-406, MW-408, and MW-409A).
- The results of the vapor intrusion testing conducted in accordance with the Vapor Intrusion Decision Matrix (NRT, 2016a) indicate the industrial risk pathway is currently incomplete for all structures evaluated, including the Annex building from which indoor air samples were also collected. Naphthalene was the most frequently detected parameter above an SL in soil gas with 13 of 24 samples exceeding the hypothetical residential exposure pathway SL.

- Based on the preliminary human health risk evaluation there is no current risk to human receptors except for construction workers who might perform future intrusive activities associated with areas where NAPL is present or where soil contamination is above the upper risk criteria. The potential for this is low in most areas of the site because of the cap maintenance area plan that is in place. Other media (groundwater and soil gas) do not pose a health concern to humans under current conditions.
- In the future, if the site were redeveloped as residential property the primary medium of concern would be soil. In the southern portion of the capped area, NAPL is present well below 4 feet below ground surface (bgs) limiting risk of NAPL exposure to potential construction workers. There are locations on the site (within and outside the cap maintenance area) where NAPL is present and risks are present above the upper risk management criteria. In these locations, exposure to human receptors could pose a potential health concern if, during redevelopment, the impacted soil was exposed at the surface. Soil COCs identified include cPAHs and NAPL for industrial and construction worker exposure scenarios; and, arsenic, cPAHs, ethylbenzene, 2-methylnaphthalene, cyanide, mercury, xylenes, and NAPL for the residential exposure scenario.
- Based on the presence of volatile contaminants and NAPL in the soil and groundwater, if the site were redeveloped for residential use in the future, vapor intrusion would also have to be considered as a potentially complete exposure pathway.

1. INTRODUCTION

This Remedial Investigation (RI) Data Summary Report prepared by O'Brien & Gere Engineers, Inc., a Ramboll company (Ramboll) for Wisconsin Public Service Corporation (WPSC), documents the activities completed at the Former Green Bay Manufactured Gas Plant (MGP) upland operable unit (OU1) in Green Bay, WI (Figure 1).

1.1 Background

The former WPSC Green Bay MGP (Site) is one of six former MGP sites addressed through the Administrative Order on Consent (AOC) and Statement of Work (SOW), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Docket No. V-W-06-C-847, dated May 5, 2006. The Site is currently enrolled in the United States Environmental Protection Agency (USEPA) Superfund Alternative Site (SAS) program. Under the AOC/SOW, a generic approach to addressing the six sites is to be developed (the Multi-Site approach), describing the procedures and tasks to be followed to complete the Remedial Investigation/Feasibility Study (RI/FS) at the former Green Bay MGP facility (Figure 2), which, in turn, may be modified to account for site-specific differences that may exist at a particular location. To facilitate project progress, the site has been divided into a sediment operable unit (OU) and an upland OU. The upland OU (OU1) extends from the top slope of the East River riverbank, landward and includes soil, groundwater, and potential vapor. The sediment OU (OU2) extends from the top slope of the East River riverbank, riverward and includes channel sediments, underlying clay, and surface water.

The USEPA-approved Site-Specific Work Plan (SSWP) Revision 2 (NRT, 2015) was implemented in October 2015 and February 2016 to characterize the extent of MGP residuals in the subsurface soil and groundwater; and, evaluate vapor intrusion pathways. Supplemental vapor intrusion and indoor air sampling were implemented between August and December of 2016 in accordance with the USEPA-approved VI Technical Memorandum Revision 1 (NRT, 2016b). An RI data summary package was submitted to USEPA for discussion on February 10, 2017. At the direction of USEPA, discussion of upland RI activities was suspended while remedial activities were being completed in OU2. Routine semi-annual groundwater sampling has been ongoing following the quarterly events completed in 2015 and 2016. This data summary report discusses soil, groundwater, and soil gas data collected through May of 2020, including soil data collected in 2018 as part of shoreline removal activities. A summary of planned and completed activities is provided in Table 1.

1.2 Work Objective

The objective of the RI activities was to evaluate the nature and extent of MGP residuals in soil, groundwater, sediment, surface water, and vapor at the Site for use in human health and ecological risk assessments and feasibility studies. Sediment and surface water will not be discussed further in this data summary report as they will be addressed in a separate Remedial Investigation report for OU2. The risk assessments will determine if the Site presents a risk to human health and/or the environment. The results of the RI will be used to evaluate whether further evaluation or remedial actions are warranted at the Site. Evaluation of remedial actions, if necessary, will be presented in the FS.

The objective of this data summary report is to discuss the nature and extent of MGP residuals present in OU1. This report also provides general discussion of the human health and ecological risks of the site under current conditions. A complete Baseline Risk Assessment will be provided in the full RI Report.

As described in the Completion Report (NRT, 2014), SSWP Revision 2, and other USEPA approved Addenda and Technical Memoranda, the media and locations that required further assessment and/or which were not fully addressed by previous work with respect to public health, welfare, or environment included the following:

- Surface and sub-surface soil exploration on and off the former MGP property to refine extent of MGP residuals and provide additional data for assessment of remedial alternatives and migration pathways
- Groundwater sampling to evaluate concentration trends and assess alternatives
- Vapor probe installation and indoor air sampling to assess migration pathways on and off of the former MGP property

1.3 Site Background

1.3.1 Site Description

Project Contact	Wisconsin Public Service Corporation 700 North Adams Street, P.O. Box 19002 Green Bay, WI 54307 9002 Mr. Frank Dombrowski (414 221-2156)
Facility Address:	700 North Adams Street Green Bay, Wisconsin
Site Location:	Section 25 and 26, T24N, R20E City of Green Bay, Brown County, Wisconsin (Figure 1)
Current Use of Property:	Parking for the WPSC Division Office, General Office, and Annex Buildings and Associated Bank Office Building
Past Use of Property:	Manufactured Gas Plant
USEPA ID #	WIN000509948
WDNR BRRTS #	02 05 000254
WDNR FID #	405063890

The former Green Bay MGP property is located in Green Bay, Wisconsin, immediately east of the WPSC corporate offices. The former MGP property (Figure 2) is approximately 4 acres in size, while the entire area owned by WPSC covers approximately 13 acres. The property is bounded by the Fox and East Rivers on the north, by North Jefferson Street on the west, by North Madison Street on the east, and by Elm Street on the south (Figure 2).

For the purposes of this document, the following definitions will be used herein:

- **Property** – Refers to the land owned by WPSC.
- **Facility** – Refers to the former WPSC MGP structures and related areas, which were largely confined to the area of the southern parking lot. (Figure 2).

- **Site** – Refers to areas where contamination related to the former MGP has been discovered through site investigation activities completed to-date and nearby areas necessary for implementation of the response action. These areas include the facility and property as well as near shore sediments within the East River (near the confluence of the Fox River) (Figure 2).

The former MGP facility is a currently used as a parking lot and is entirely paved (Figure 3). A river walk area, located on an easement to the City of Green Bay occupies the area immediately adjacent to the Fox River/East River shoreline. In relation to the former MGP property, the WPSC General Office and Annex Buildings are located northwest, the WPSC corporate Division Office Building is located west, the KI Convention center is located southwest, the Associated Bank Office Building is located south, and the Associated Bank Office Building parking areas adjoin the Site to the south and east, respectively (Figure 3). Property parcel numbers are also shown on Figures 4 and 5.

1.3.2 Site Utilities

Underground utilities on and near the former MGP property are shown on Figure 3 while the nearby property zoning is indicated on Figure 4.

1.3.3 Site History

The former Green Bay MGP property was owned by the Green Bay Gas Light Company (GBGLC) and began operating in 1871. In 1922, GBGLC merged with other utilities to form WPSC. The MGP property was used to convert coal and other hydrocarbon feed stock into gas for heating and lighting until the late 1940s when natural gas became readily available through pipelines.

The Green Bay MGP utilized the coal gas production method until carbureted water gas machines were installed in 1919 and 1922. The MGP operated until 1947. The facility was dismantled in 1950, except for one gas holder, which was dismantled in 1975 (EDI, 1986). Previously existing MGP related structures are shown on Figure 2. Former MGP related structures of significance include:

- Boiler, relief, and condenser houses
- Two condenser tanks approximately 12 feet in diameter
- Three oil tanks approximately 15 feet in diameter
- A tar well approximately 50 feet in diameter
- Four gas holders ranging in diameter from approximately 40 to 140 feet, with capacities of 15,000 cubic feet (ft^3), 40,000 ft^3, 300,000 ft^3, and 1,000,000 ft^3
- Three purifiers approximately 20 feet in diameter

One feature that was not identified until later during investigation activities was a historic sewer line that was a potential conduit for contaminant migration between the former MGP operational area and the East River. This line is approximated on Figure 2 and was investigated during the latter part of the Phase II activities and remediated as part of 2003 soil remediation activities.

1.3.4 Nearby Sites with Non-MGP Sources

A search of the WDNR Bureau for Remediation and Redevelopment Tracking System (BRRTS) database identified nine other sites that lie within approximately 1,200 feet of the former MGP facility that have the potential to affect Site media or release contaminants to co-mingle with

MGP residuals (Figure 4). One of these sites was a former leaking underground storage tank (LUST) on the WPSC property, which is now closed. Of these sites, four are in the WDNR LUST program and five are in the WDNR Environmental Repair Program (ERP). Three sites remain open located about 900 feet from the former MGP facility.

Sites judged to have potential for related contaminants to migrate onto the Site or co-mingle with known areas of MGP residuals included the former Regency Suites Hotel (now the Associated Bank Office Building) and former Regency Parking Lot 2 due to their proximity and up-gradient location relative to the Site (Figure 4). Although both sites are closed, PAHs were present in site soil. The 2012 investigation included soil and groundwater analysis and the benzo(a)pyrene (BaP) and benzo(a)anthracene (BaA), which are parameters of interest discussed herein, were detected at concentrations above applicable standards in both media. The results were included in SSWP discussion of soils and the BRRTS GIS Registry Packet was included in Appendix A of the SSWP.

1.3.5 Previous Investigations

The Completion Report (NRT, 2014) contains a full bibliography of the reports and summaries issued for the Site. Site investigation and historic soil excavation activities were completed between 1994 and 2003 and groundwater monitoring has continued through May 2014 to assess conditions since soil remediation. Investigations have focused on identifying source areas, determining the presence of former MGP structures, and groundwater plume stability. Investigations included soil borings, test pits, soil samples, sediment samples, and groundwater sampling from monitoring wells and piezometers.

1.3.6 Previous Response Actions

1.3.6.1 Overview

Soil remediation was undertaken in 2003 with the objective of removing significant soil impacts and source areas with the goal of meeting established criteria for natural attenuation as a final remedy. Areas to be addressed were based on the soil analytical results obtained between 1994 and 2002. The selected remedy was source area excavation with medium temperature thermal desorption (MTTD). Details of the remedial work were summarized in Section 4 of the Completion Report (NRT, 2014).

The primary remedial action objectives for site remediation were to:

- Reduce the potential for direct contact exposure to MGP residuals
- Reduce leaching of MGP residuals to groundwater
- Reduce migration of MGP residuals to the East River

The remedial components used to meet these objectives consisted of:

- Source area excavation and debris management
- Off-site thermal treatment of soil
- Treatment of extracted groundwater on site prior to discharge to the sanitary sewer
- Placement of asphalt or approximately 1 foot of cover soil across the site for direct contact protection.

1.3.6.2 Source Area Excavation

Excavation and decommissioning of former MGP structures and piping removed approximately 30,075 tons of soil and debris from four areas (Figure 5) that included the following:

- Area 1 - included the 300,000 ft^3 gas holder near Elm Street
- Area 2 – included the former tar well, oil tanks, purifiers, and small gas holders
- Area 3 – included the suspected discharge area of the former concrete channel to the river
- Area 4 – included an area along the East River bank near well MW-410 (elevated cyanide)

In addition, former MGP and sewer piping was excavated and treated, and this included the former concrete channel between the tar well and Area 3.

Excavation limits were determined by visual inspection because this was intended as a source area removal effort. The main purpose for excavation was to remove former MGP infrastructure (pipes, channels, tar well, etc.) considered to be sources of the tar impacted material. Excavations did not extend laterally or vertically to remove tar that occurred in clay fractures or silt seams as approved by WDNR in the 2003 Remedial Action Work Plan. The extent of the excavation areas is shown on Figure 5 and a summary for each is below, along with the volume of material excavated and how it was treated or disposed.

Table B. Excavation Volumes and Disposal Summary

Site Area/Feature	Depth Excavated ft. bgs (approx.)	Tons Excavated	Backfill Material	Final Disposal
Area 1	6-8	3,484	Imported Sand; Treated Soil	Excess soil thermally treated and debris disposed at Hickory Meadows
Area 2 & Tar Well	16-22 tar well, 8-14 other	14,461	Treated Soil	
Area 3	8-12	7,715	Treated Soil	
Area 4	7	173	Treated Soil; Imported Gravel	

Area 1

Excavation depths ranged from 6 to 8 feet bgs around the former 300,000 ft^3 gas holder near Elm Street. Approximately 3,484 tons of MGP impacted soil was excavated from Area 1 (Figure 5) and thermally treated. Approximately 90 to 95 percent of the concrete base of the gas holder was also removed. Due to existing utilities and structures, a small portion of the base was left in place but other MGP conveyance piping, sewers, and impacted soil were excavated.

Area 2

The former tar well, oil tanks, purifiers, small gas holders, and additional MGP conveyance piping and sewers were excavated from Area 2 (Figures 2 & 5). The former 50-foot diameter tar well extended approximately 16 - 20 feet bgs and was filled with heavily MGP impacted soil and debris. An additional gas holder (possibly the remains of a 15,000 ft^3 gas holder) was encountered and filled with similar material. These structures, the material within them, and adjacent soils were excavated and thermally treated. Former MGP piping or structures and pockets of impacted soils were excavated south of the tar well. More than 14,460 tons of MGP impacted soil was excavated

from Area 2 and thermally treated. Excavation depths ranged from 16 - 22 feet bgs within the tar well, 10 - 12 feet bgs in the 15,000 ft^3 gas holder area, and 8 - 14 feet bgs in surrounding areas.

Area 3

This included the suspected discharge area for the former concrete channel to the East River, where heavily impacted soils and debris were found (Figure 5). MGP impacted wood, wood chips, and wood debris (likely from historic building demolition and filling of the former shoreline) was also excavated. Sheet pile was installed along the East River (Figure 5) to facilitate excavation and was cut off in place to serve as a barrier between remediated areas and the East River. Excavation depths ranged from 8 - 12 feet bgs and approximately 7,715 tons of MGP impacted soil was excavated and thermally treated.

Area 4

This area was excavated due to the presence of MGP impacted wood and wood chips in test pit TP-9 and elevated total cyanide concentrations in groundwater at well MW-410 (Figure 5). The objective was to remove a portion of the MGP impacted wood and wood chips contributing to localized contamination. The excavation was approximately 70 feet long and 25 feet wide surrounding well MW-410 and was completed approximately 7 feet bgs. Approximately 173 tons of excavated wood, soil, and debris were disposed at an off-site landfill.

Former Piping and Other Infrastructure

All MGP related piping, sewers, and structures were excavated to depths of 5 to 10 feet bgs as part of the remediation effort as discussed in the Completion Report (NRT, 2014). Many former MGP conveyance pipes and sewers were excavated according to plan but others were excavated as encountered during excavation (Figure 5). There are no other known MGP piping locations and those identified on Figure 5 were considered when developing the soil vapor sampling. Where inaccessible or at excavation extents, pipes were abandoned in place and filled with concrete grout to prevent preferential migration of groundwater. Heavily contaminated conveyance piping, sewers, and structures were removed and segregated for disposal at an off-site landfill while the surrounding soils were excavated and thermally treated.

1.3.6.3 Excavation Sampling and Backfilling

Confirmation soil samples were collected to document in place soil quality at the excavation limits. Excavation base samples were collected to document soil quality at the bottom of the excavations while sidewall samples were collected approximately every 70 linear feet around the perimeter and at varying depths on each wall. Soil samples were analyzed for BTEX, PAHs, total and amenable cyanide, RCRA Metals, phenols and a limited number for TOC and WAD cyanide. The excavation base and sidewall sample analytical results were included in data evaluations along with other remaining soil samples.

Thermally treated soil and imported sand were used for excavation backfill. Over 18,840 tons of thermally treated soil and 4,140 tons of imported sand were used. Imported sand was used at the base of excavation Area 1 due to compaction issues and thermally treated soil was placed above; in all other excavation areas, thermally treated soil was used for the backfill material. Due to the presence of groundwater, open graded stone was placed at the base of excavation Area 4 with a geotextile fabric separation layer with thermally treated soil above. The general backfill material used in each excavation area is identified on the site cross-sections. Imported loamy soil

was placed in areas where trees and shrubs were planted along the river walk and Elm Street. Additional backfill consisted of base course for parking lot subgrade and clean stone around replaced storm sewers.

1.3.6.4 Material Management and Processing

Approximately 20,951 tons of soil were treated via thermal desorption. Following laboratory confirmation that treatment achieved acceptable levels, the treated soil was used as backfill on the MGP property. Using the arithmetic mean of all pre-treatment and post-treatment results, thermal treatment removed 99.83 percent of BTEX and 99.72 percent of PAHs in soil. Averaged over the 20,951 tons of treated soil, approximately 5,595 pounds of BTEX and 30,393 pounds of PAHs were removed by thermal treatment. In addition, approximately 356 pounds of total cyanide was removed.

Approximately 2,780 tons of treated soil and residual contaminated clay soil were disposed at the Brown County East Landfill in DePere. Approximately 6,310 tons of contaminated debris was disposed as special waste at Hickory Meadows Landfill in Hilbert while approximately 2,810 tons of debris free of contamination was disposed at an approved construction landfill.

1.3.6.5 Site Restoration

Once all excavations had been backfilled, a new asphalt surface was placed over the entire former MGP property to: 1) continue to serve as a parking lot for WPSC employees and the Associated Bank building and 2) provide an engineered barrier for direct contact protection and to limit infiltration to groundwater. The extent of the capped area to which the Cap Maintenance Plan extends is shown on Figure 5. The sidewalk area adjacent to Elm Street and the river walk area were restored with imported fill and/or topsoil and sod was placed in the grass areas near the river walk. All landscaping and utilities were restored to original conditions. Replacement monitoring wells MW-401AR, MW-402R, MW-403R, MW-410R, and MW-411AR were installed In July 2003 for continued groundwater sampling.

1.3.6.6 Shoreline Excavation Area

In 2018, riverbank shoreline soils were removed from the South Focus Area in the East River (Figure 5). 1,245 cubic yards of shoreline material was removed in front of the sheet pile wall installed to support Upland Area 3 excavation. Soils containing visually identified dense non-aqueous phase liquid (DNAPL) were removed and replaced with 0.1 acres of clean gravel.

2. SITE CHARACTERISTICS

2.1 Site Geology and Hydrogeology

The information provided below incorporates information obtained during RI activities and previous site investigations, including observations from soil borings, test pits, groundwater monitoring wells, etc. This summary is an overview for purposes of providing reference information in this RI Data Summary.

2.1.1 Regional Setting

The regional geology of Brown County, and specifically the Green Bay area, consists of Paleozoic sedimentary bedrock units overlain by unconsolidated Quaternary deposits. The regional bedrock strata dip to east and consist of a sequence of undifferentiated Silurian dolomites underlain by Ordovician dolomite, sandstone, and shale units and Cambrian sandstones (Krohelski, 1986). The unconsolidated Quaternary units in Brown County include lacustrine, fluvial, glacial till, glacial outwash, and ground and end moraine deposits.

Quaternary deposits range from 50 to 200 feet in thickness (Krohelski, 1986). The undifferentiated lacustrine deposits found in the vicinity of downtown Green Bay are silt and clay with peat and muck. The bedrock units range in thickness from approximately 200 to 1,600 feet in western and eastern Brown County, respectively. The uppermost bedrock unit in the vicinity of downtown Green Bay is the Ordovician age Sinnipee Group, which includes the Galena, Decorah, and Platteville Formations. The Sinnipee Group consists largely of dolomite with limestone and shale. Below the Sinnipee Group are other sandstone, dolomite, limestone, and shale units.

The hydrogeologic system consists of two aquifers; a sand-and-gravel aquifer occurs in the Quaternary deposits and a sandstone aquifer occurs in the Ordovician and Cambrian Formations below (including the Sinnipee Group). These units are major aquifers used by the towns and villages surrounding the City of Green Bay, as well as by major industrial facilities (Krohelski, 1986).

The City of Green Bay obtains potable water from Lake Michigan. A 42-inch pipeline transports water from a location 25 to 30 miles east of the City. Green Bay utilizes eight City-owned water-supply wells only during water emergencies or peak demand periods in the summer. None of these wells, nor any other privately owned potable wells, are located within 0.5 mile of the former MGP.

2.1.2 Local Setting

Soils encountered during the Site investigation include lacustrine and glacial deposits intermixed with fill. Surface and near surface soils are dominated by fine sand, silt, clay, and fill. The fill is predominately a black ash/cinder mix that resembles fine to coarse sand and silt; it also includes wood, glass, brick, concrete, wire, and porcelain. Fill ranges between 4 and 12 feet thick and generally the thickness increases towards the north (near the rivers).

Clay till belonging to the Glenmore Member of the Kewuanee Formation (Syverson et. al., 2011) is present beneath a majority of the Site, extending from approximately 4 feet bgs to at least 30 feet bgs (it is present at the base of the piezometers). The clay till is, red to red-brown, firm to hard, and usually fractured with thin, sporadic silt and fine sand seams throughout. The depth to clay increases approaching the river as this area was historically filled. WPSC records indicate the

shoreline was much further south in 1829/1835 (Figure 6). Sanborn maps indicate the area was filled during specific time periods but the shoreline has remained at its present location since 1970.

The Brown County Soil Survey (USDA-SCS, 1972) describes the entire area north of Cedar Street (one block south of Elm Street) as land that has "been filled with various soil materials and other wastes". As indicated by the boring logs and cross sections, the layers are discontinuous and facie changes occur over short distances, showing the influence of fill placement over the area. None of the investigation soil borings were extended to or encountered bedrock, which is consistent with the regional geology information.

2.1.3 Site Hydrogeology

Shallow groundwater is monitored within sand and fill materials that overly the clay till belonging to the Glenmore Member of the Kewuanee Formation. Groundwater flows from the site toward the Fox River and the East River in the shallow materials and has been generally consistent throughout the course of various investigations. Piezometers are screened in the underlying clay which acts as a lower confining layer. See Section 4.2 for more detailed discussion of site hydrogeology.

2.2 Population and Land Use

Brown County, Wisconsin encompasses approximately 616 square miles, of which 530 square miles is land and 86 square miles is water, with agricultural land use being the dominant classification. The population of Brown County is 262,052 (US Census Bureau 2017) and the greatest concentration of people are located in and around the City. The City encompasses approximately 56 square miles, of which 46 square miles is land and 10 square miles is water, and has a population of approximately 105,116 people (US Census Bureau 2017). The City has a mixture of agricultural, residential, and industrial land use, with residential use being dominant.

As discussed in the SSWP (NRT, 2014) and shown on Figure 4, most of the land surrounding the former MGP facility is zoned as business district, conservancy, and commercial. Lake Michigan is the drinking water source for the City, so groundwater is not used for potable purposes. Chapter 16 of the City of Green Bay plumbing code requires compulsory connection of buildings to Sewer Service and Water. A search of online resources for nearby potable wells indicated none are located within 0.5 mile of the former MGP facility.

3. SITE CHARACTERIZATION ACTIVITIES

3.1 Timeline of Recent Site Characterization Activities

The following table summarizes the timeline of RI characterization activities:

Activity	Date(s) Completed
Surface and subsurface soil sampling Soil gas probe installation	October 2015
Quarterly groundwater sampling, NAPL thickness measurements	November 2015
Quarterly groundwater sampling, NAPL thickness measurements Soil gas sampling Supplemental soil borings surrounding the Annex	February 2016
Quarterly groundwater sampling, NAPL thickness measurements, Slug testing	May 2016
Quarterly groundwater sampling, NAPL thickness measurements Soil gas sampling Well network repair	August 2016
Indoor air and ambient air sampling	August 2016
Quarterly groundwater sampling, NAPL thickness measurements Soil gas, indoor air, and ambient air sampling	December 2016
Continued semi-annual groundwater monitoring activities	May and November
Soil borings to support shoreline removal area	August 2018

3.2 Site Specific COPCs

COPCS on the site include PVOCs, PAHs, and cyanide.

Medium	CPOC	
Soil	PVOCs	Benzene, Ethylbenzene, Toluene, Total Xylenes, 1,2,4-Trimethylbenzene
	PAHs	1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenz(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Pyrene
	Metals, Total	Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver
	Inorganics	Cyanide
Groundwater	PVOCs	Benzene, Ethylbenzene, Toluene, Total Xylenes
	PAHs	1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenz(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Pyrene

	Metals, Dissolved	Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver
	Inorganics	Cyanide
Soil Vapor	PVOCs	Benzene, Ethylbenzene, Toluene, Total Xylenes, 1,2,4-Trimethylbenzene, Naphthalene

3.3 Soil Sampling

Seventeen hand auger borings (HA-401 through HA-417), twenty-one soil borings (SB- 418 through SB-438), and thirteen soil borings for conversion to soil gas probes (SG-401 through SG-404, SS-405A/B, SG-406 through SG-412) were completed between October 19 and 21, 2015. Locations were selected based on approval of the SSWP Rev 2 (NRT, 2015). Nine step out borings (SB-418A through SB-418I) were completed to evaluate the extent of NAPL observed above the clay in then north parking lot near the Annex Building. Four additional step out borings (SB-418J through SB-418M) were completed to evaluate soil quality within 30 feet of the Annex Building to support the soil vapor evaluation. The locations of all RI and previous soil sampling locations that remain after 2003 and 2018 remedial actions are illustrated on Figure 6.

Hand auger borings were completed by NRT personnel using a 3-inch diameter bucket auger. Soil borings were installed by On-Site Environmental Services (On-site) in accordance with the Multi-Site FSP SOP No. SAS-11-03 using direct-push techniques which resulted in a 2-inch borehole.

Samples were classified following SOP SAS-05-02 from the Multi-Site FSP. During drilling, soil borings were continuously field-screened to document subsurface conditions and identify samples for laboratory analysis according to SOP SAS 06 01 from the Multi-Site FSP. Visual, photoionization detector (PID) readings and olfactory observations were used to assess the presence/absence of MGP residuals in the subsurface as noted in the Field Logging and Classification of Soil and Rocks SOP SAS-05-02.

Surface and subsurface soil samples were collected for laboratory analysis as follows:

- Between the East River and upland remediation areas as indicated by the SSWP (NRT, 2015)
- Where there were no visual, olfactory, or PID indications of impacts one vadose zone sample of representative soils from intervals
- Where there were indications of impacts, one sample was taken from the impacted interval, and an additional sample was collected from a lower interval where there were no visual, olfactory, or PID indications of impacts

Soil samples were submitted to Pace Laboratories located in Green Bay, Wisconsin (a National Environmental Laboratory Accreditation Program [NELAP] laboratory) and analyzed for some or all of the following parameters:

Parameter	Method
BTEX + 1,2,4 Trimethylbenzene	8260B
PAHs	8270-SIM
RCRA Metal	6020A / 7471
Ammenable Cyanide	9012
Organic Carbon, Total	Walkley Black
Alkylated PAHs	B5739/8270M SIM
Widescan GC	B3328-06

Analytical testing results were submitted to Shepherd Technical Services for independent third party data validation.

3.3.1 Differences between the SSWP and Field Work Completed

Nine step-out soil borings (SB-418A through SB-418I) were added during the October 2015 adjacent to SB-418 because of field observations of soil impacts (MGP residuals, MGP odors, discolored soil, and elevated PID readings). Step-out borings were used to define the lateral and vertical extent of NAPL. One soil gas probe boring (SG-401) was extended to a depth of 15 ft bgs to further define the lateral and vertical extents of NAPL.

In July and August of 2018 nineteen soil borings (S-AU through S-SU) were completed and logged for visual observations of NAPL to support the shoreline removal action. No analytical samples were collected from these borings. Locations with visual observations of NAPL were removed during shoreline excavation activities and backfilled clean gravel.

3.4 Groundwater Evaluation

3.4.1 Sampling Schedule and Parameters

Groundwater was monitored for four quarters following the approval of the SSWP Rev 2 (NRT, 2015). Following the initial four quarters of sampling, the monitoring frequency returned to semiannual and available cyanide testing was discontinued. Field parameters were also recorded for each groundwater sample including pH, temperature, dissolved oxygen, oxidation/reduction potential, conductivity, and turbidity. Laboratory analysis for RNA parameters includes dissolved iron, nitrate +nitrite, sulfate, methane, and dissolved manganese. Monitoring well locations are illustrated on Figure 7.

Groundwater samples were submitted to Pace Laboratories located in Green Bay, Wisconsin and analyzed for some or all of the following parameters:

Parameter	Method
BTEX	8260
PAHs	8270-SIM
RCRA Metal	6020A
Nitrite + Nitrate	353.2
Sulfate	300
Available Cyanide	OIA-1677

Analytical testing results from the first four quarters of sampling were submitted to Shepherd Technical Services for independent third party validation. No significant data quality issues were observed and validation of routine groundwater sampling results was discontinued for subsequent semi-annual events consistent with other sites in the multi-site program.

3.4.2 Aquifer Characterization

Previous aquifer test data was collected in 1995. Given the time elapsed since the last assessment, slug tests were performed in May 2016 to assess whether current site conditions are similar to historic conditions.

A minimum of two falling head (slug-in) and two rising head (slug-out) tests were performed in May 2016. Monitoring wells MW-402R, MW-405A/B, MW-406, MW-408, MW-409A, MW-410, and MW-414 were chosen for reevaluation to compare historic hydraulic conductivity value against current site conditions. Four additional wells (MW-412, MW-411AR, MW-415A, and MW-416) that were installed after the initial aquifer characterization were chosen to provide a more complete understanding of site conditions.

The tests were performed in accordance with SOP SAS 08-04. Slugs were constructed using 1-inch outer diameter PVC piping, filled with sand, and sealed with rubber end caps. Slug length used (lengths between 2 ft to 5 ft) was determined by lithology and water column height within the well. Well recovery was recorded using a Rugged Reader Pocket PC and Level Troll 700 data loggers (transducer).

Static groundwater measurements were recorded prior to each test. The transducer was placed in the well approximately one foot above the bottom of the well. Once groundwater levels stabilized, the slug was rapidly inserted / removed to approximate an instantaneous change in head. Groundwater recovery and stabilization was verified between tests using a water level indicator before beginning the next test. Well recovery data were analyzed using AQTESOLV ® version 4.5 Professional software.

3.4.3 Differences Between the SWPP and Field Work Completed

There were few deviations to the SWWP during the May 2016 field work. Alternate slug test wells were chosen for three wells for the reasons provided below:

Proposed Well	Alternate Well	Justification for Change
MW-405A	MW-403R	NAPL present in MW-405A
MW-405B	MW-401BR (failed test)	MW405A was under water due to high amounts of precipitation and low relative elevation in parking lot, results of MW401BR were not usable due to precipitation effect on low permeability test
MW-409A	No alternate (similarly screened wells included with original assessment)	Well under water due to high amounts of precipitation and low relative elevation in parking lot

3.5 Soil Vapor Sampling

In October 2015 surface and subsurface soil sampling was conducted as specified in Revision 2 of the Site-Specific Work Plan for Upland Areas (October 9, 2015). Several step-out borings (SB-418A

through SB-418I) were completed as part of this sampling event to evaluate the extent of potential MGP residuals east of the Annex Building. As an extension of the step-out boring program initiated in October 2015, a second subsurface soil sampling event took place on February 8, 2016 to evaluate potential soil impacts adjacent to the east side Annex Building. Four Geoprobe® soil borings (SB-418J, SB-418K, SB-418L and SB-418M) were advanced to a depth of 15-ft below ground surface. Laboratory reports on the soil samples collected for analysis indicated detected concentrations of contaminants of potential concern (COPC). Soil gas results collected in February 2016 from nearby soil vapor probes SG-401 and SG-402 (Figure 7) also included detections of MGP VI COPCs and an exceedance of the benzene industrial screening level at SG-401. The depth to watertable in the area of the Annex Building has ranged between 4.5 and 8-ft below ground surface (bgs).

Site reconnaissance of the Annex Building completed in October 2016 indicated heating and air conditioning is supplied by the neighboring Division Office Building and the southern portion of the building has a basement that is used for storage of office and janitorial supplies which is not regularly occupied by workers. The basement does not contain sumps connected to drain tile around the building; however, the building does contain two small water collection points that were installed to prevent groundwater from upwelling through the slab. These water collection points are comprised of a small (approximately 4-inch diameter) corehole through the slab that is connected to a small pump that keeps the water level below the slab (Photo 1). No odors were observed during site reconnaissance.

Photo 1. Water Collection Point in Basement of Annex Building

Available site investigation data were compared to the approved (NRT, February 10, 2016) Vapor Intrusion Investigation Decision Matrix (VIDM) which indicated soil gas, sub-slab, and indoor air sampling were the next steps for evaluation of the VI exposure pathway at the Annex Building.

Nested Sub-Slab and Soil Gas probes (SS413/SG413D and SS414/SG414D) were completed within the Annex building in August of 2016 per the USEPA approved VI Technical Memorandum (NRT, 2016b). Coincident samples of indoor air, ambient air, sub-slab, and soil gas were collected from the Annex building in August and December of 2016 to evaluate the VI pathway.

VI samples were submitted to STAT Analysis Corporation (a NELAP) located in Chicago, Illinois and analyzed for all of the following parameters:

Parameter	Method
BTEX, naphthalene, and 1,2,4 TMB	TO-15
Oxygen, Carbon Dioxide, Methane	ASTM D1946

Analytical testing results were submitted to Shepherd Technical Services for independent third party data validation.

3.5.1 Differences Between the SWPP and Field Work Completed

Soil gas samples could not be collected from locations SG209, SG210, and SG212 due to the presence of water in the sample collection lines during sampling events. These probe depths range from 2.5 to 4 feet below ground surface and could not be constructed any shallower without risk of short circuiting with the atmosphere. Therefore, no soil gas data is available from these locations.

3.6 2020 Pre-Design Investigation Activities

August 23, 2019, EPA Office of Land and Emergency Management released Use of Early Actions at Superfund National Priorities List Sites and Sites with Superfund Alternative Approach Agreements Memorandum, which encourages consideration of early action as part of the overall strategy for site management. The memorandum states that actions should be taken at the point that sufficient information is available to support a response to mitigate risk or limit contaminant migration, which is consistent with Section 300.430(a)(l) of the National Contingency Plan. The objective of early actions is to achieve signification risk reduction, address immediate risks to human health and the environment, to control migration of contamination or in support of property reuse. The response action is considered an "early action" because it is taken before completion before the RI/FS phase for the site or OU is complete.

To proceed to the RI/FS and further design for an early action at the former WPS Green Bay MGP, additional information is required to design the remedy for the upland portion of the site. This additional information will be obtained through implementation of a PDI Work Plan (Ramboll 2020), which includes monitoring well installation and soil boring installation being completed in August and September of 2020. This RI data summary report does not include information obtained during PDI activities, which are focused around MGP residuals located in the north parking lot area. Results of the PDI will be included with the early action design report.

4. INVESTIGATION OBSERVATIONS AND RESULTS

4.1 Soil Results

A summary of post-excavation oil wetted/oil coated NAPL observations that remain on site is presented on Table 2 describing NAPL observations prior to 2020 PDI data collection. Results of soil samples exceeding a screening levels (SLs) are summarized in Table 3. Tables of soil sampling results are provided in attached Excel file Tables 4 and 5. The distribution of NAPL is illustrated on Figure 8. Cross-sections are illustrated on Figures 9a through 9e. Distribution of PAH, PVOC, and inorganics in soil are illustrated on Figures 10 through 12. Results of forensic fingerprinting are presented on Figure 13. Boring logs of soil borings, soil gas probes, and monitoring wells completed during the RI will be provided in the RI report. The analytical lab reports, the soil forensic lab report, and data validation reports will also be provided in the RI Report.

4.1.1 MGP NAPL Observations

Comments on the PDI workplan received on May 29, 2020 from USEPA included the following regarding the extent of NAPL: General Comment 1b. *The extent of subsurface NAPL in the area of the former MGP structures south of the Utility Court are not known. Based on a review of Table 12 from the 2003 Remedial Action Documentation Report, the side wall and bottom samples from the four excavation areas still have exceedances of screening levels. For example, Sample EW 2-4 (7 ft) has detections of benzene at 8,900 ppm, benzo(a)pyrene at 11,000 ppb, and naphthalene at 95,000 ppb all of which are above screening levels. Additionally, the statement on page 15 of the 2020 PDI WP that excavations did not proceed laterally or vertically to remove tar that occurred in clay fractures or "silt seams", indicates there may be NAPL that extends laterally from the excavation areas in silt seams. The extent of NAPL does not appear to be defined.*

The horizontal and vertical limits of NAPL in the area of the former MGP structures south of Utility Court were further defined by RI data collection completed in 2015. The lateral extent of oil wetted/oil coated material within clay fractures south of Utility Court is illustrated on Figure 8. There were no observations of any NAPL (oil wetted, oil coated, sheen or staining) in soil borings SB-421 through SB-430 completed in 2015 around the perimeter of the former MGP property (Figure 6). Cross-sections D-D', E-E', G-G' and H-H' (Figures 9b, 9c, and 9d) illustrate the lateral and vertical delineation of NAPL observations in the subsurface in this area. The absence of benzene and naphthalene exceedances in groundwater collected from monitoring wells MW414, MW415A, and MW418 (discussed in Section 4.2 below) further supports the assessment that the limits are NAPL are defined and do not extend beyond the streets surrounding the former MGP property to the east, west, and south. NAPL extent in the northern parking lot is currently being evaluated as part of the PDI and Early Removal Action. The lateral and vertical extent of NAPL in the northern parking lot area based on RI data collected prior to the PDI is illustrated on cross-sections A-A', B-B', C-C', and F-F' (Figures 9a, 9b, and 9c).

Visual impacts were typically noted in conjunction with odors and elevated PID readings. Where NAPL residuals were highly weathered (e.g., "staining"), olfactory or PID indications were at times absent. A detailed discussion of NAPL observed in clay factures collected from SB418E is included as Appendix 1. Thin vertical to near vertical fractures present in the clay ranged in length from 0.1 to 0.3 feet and were less than 1 millimeter (mm) wide. Oil wetted material ranged from dry, hard material with a shiny black luster, to viscous tar-like material that pulls

apart like taffy, to very fine droplets (less than 1 mm) that rise out of a fracture and can transfer to gloves. Though the fractures containing NAPL can be relatively long, they are very thin and comprise a relatively small amount of the total core volume, visually estimated to be less than 5% (trace amounts). Clay intervals with NAPL in native clay fissures have an average thickness of approximately 3 feet (Table 2). The extent of soils exceeding SLs is described below.

4.1.2 Soil Sampling Results

Results from individual soil samples were compared to residential and industrial SLs and are presented on Excel Tables 4 and 5 for ease of review. The distribution of PAH SL exceedances is presented on Figures 10a through 10e. The figures are grouped by depth interval: surface soils residential (0-0.5 feet), surface soils residential and industrial (0-4 feet); and, residential and industrial soils greater than 4 feet deep. Benzo(a)pyrene, which has many potential sources, was plotted individually for comparison to other PAHs. Naphthalene, which is a common indicator of MGP residuals, was also plotted individually for comparison to other PAHs. Benzo(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-CD)pyrene were grouped together for comparison to other PAHs because one or more of these PAHs were found to exceed an SL in the same interval with naphthalene (Table 4). Remaining PAHs were then grouped together. Using these groupings it can be inferred that benzo(a)pyrene exceedances paired with naphthalene, or the group of benzo(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-CD)pyrene are more likely related to MGP residuals. For example, HA-405 only exceeds for benzo(a)pyrene (Figure 10a) and forensic results from the 0-1.5 foot interval indicate the source at that location is urban background (Figure 13).

Residential PAH exceedances likely related to MGP residuals in surface soils (0-0.5 and 0-4 feet) occur within the cap maintenance area with the exception of samples from SB-431, SB-433, SB-437 in the Riverwalk area (the easement between the cap maintenance area and the East River) (Figures 10a and 10b). Industrial PAH exceedances likely related to MGP residuals in surface soils (0-4 feet) also occur within the cap maintenance area with the exception of SB-433 (Figure 10c). Residential and industrial surface samples from 0-4 feet delineate the extent of soil impacts around the cap maintenance area and in the Riverwalk area upstream and downstream of the site.

Residential PAH exceedances likely related to MGP residuals in sub-surface soils (i.e., greater than 4 feet) occur within the cap maintenance area with the exception of samples from EW-3-3, SB-418B, SB-431, SB-432, SB-433, SB-437, SB-438 located in the Riverwalk area (Figure 10d). Industrial PAH exceedances likely related to MGP residuals in sub-surface soils (greater than 4 feet) also occur within the cap maintenance area with the exception of EW 3-3, SB-433, SB-437, and SB-438 in the Riverwalk area (Figure 10e). Residential and industrial sub-surface samples from greater than 4 feet delineate the extent of soil impacts around the cap maintenance area and in the Riverwalk area upstream of the site. The Riverwalk area downstream of the site is currently being evaluated as part of the ongoing PDI activities in 2020.

PVOC exceedances of residential surface soils (0-0.5 and 0-4 feet) are limited to three locations within the cap maintenance area: benzene observed at HA-417 and SB-401, and ethylbenzene observed at SB-419-1994 (Figures 11a and 11b). Only one industrial PVOC exceedance was observed in surface soils (0-4) at SB-419-1994 within the cap maintenance area. Residential and Industrial PVOC exceedances in sub-surface soils (greater than 4 feet) occur within the cap maintenance area with the exception of ethylbenzene from SB-438 located in the Riverwalk area

(Figures 11d and 11e). Residential and Industrial PVOC exceedances in surface and subsurface soils are limited and well defined.

Exceedances of residential surface soils (0-0.5 and 0-4 feet) for inorganic compounds are limited to four locations: thallium at SS-2, total mercury at SB-419, total arsenic at SB-420, and available cyanide at EW4-4 within the cap maintenance area (Figures 12a and 12b). There were no exceedances of industrial surface soils (0-4 feet) for inorganic compounds (Figure 12C). Exceedances of residential and industrial sub-surface soils (greater than 4 feet) occur within the cap maintenance area with the exception of EW 3-1, SB-431, SB-437, and SB-438 which have total arsenic exceedances greater than the Wisconsin background level of 8 mg/kg. SB-431 also exceeded the lead SLs (Figures 12d and 12e). Residential and industrial exceedances of sub-surface soils (greater than 4 feet) for inorganic compounds occur in the north parking lot area and are largely coincident with PAH exceedances discussed above, they are not present south of Utility Court.

Forensic fingerprinting samples were taken from five soil borings (SG-409, SB-418, SB-418F, SB-426, and SB-432) and two hand auger locations (HA-402 and HA-405). MGP related results were identified at four of the soil boring locations as follows (Figure 13):

- SG-409 was consistent with containing tar like material (TLM)
- SB-418 was consistent with containing TLM and purifier material
- SB-418F was consistent with tar distillate, condensate, and drip oil (associated with pipelines)
- SB-432 was consistent with containing TLM and purifier material

The remaining locations were indicative of non-MGP sources or urban background with no identifiable source.

Lateral and vertical extents of MGP indicator parameters benzene and naphthalene in soil are well defined at the Site and generally coincident with former MGP structures, piping runs, and locations with observations of NAPL described above. There are fewer locations with PVOC exceedances than locations with PAH exceedances at the site and the PVOC exceedances are co-located with the PAHs exceedances. There are fewer exceedances of inorganic constituents in soil than PVOCs or PAHs. Forensic analysis of soil samples collected in October 2015 indicate PAHs found near the edge of the Site SB-426, HA-402, and HA-405 have sources other than the former MGP Site. As part of ongoing PDI investigation activities, additional soil samples are being collected from the Riverwalk area and portions of the northern parking lot area. The risks presented by residual soil concentrations are discussed in Section 5.

4.2 Groundwater

This section summarizes hydrogeology, groundwater observations, analytical results, and trends. Groundwater monitoring has been performed to assess the extent of groundwater impacts and the efficacy of monitored natural attenuation. Samples were collected using low flow sampling methods. Groundwater elevations, vertical gradients, and NAPL observations for the last 4 years of data are provided in Table 6. Groundwater summary statistics are presented on Table 7. Analytical tables are provided as Excel Tables 8a, 8b, and 9. Groundwater MNA and summary of concentration trends are provided in Tables 10 and 11. The groundwater analytical lab reports, tables of all groundwater results, and a table of non-detects that exceed SL will be provided in the RI Report. Groundwater analytical results are compared to Wisconsin Groundwater RAF SLs

and Wisconsin Preventive Action Limit (PAL) for discussion of nature and extent of groundwater impacts. Groundwater analytical results have also been compared to groundwater to vapor screening levels for discussion of risk to vapor intrusion; and, groundwater has been compared to tap water screening levels for informational purposes and discussion in the Baseline Risk Assessment to be submitted with the full RI Report for OU1.

4.2.1 Hydrogeology

Groundwater elevation measurements were collected from some wells beginning in December 1994. The groundwater flow direction has been generally consistent throughout the course of the various investigation activities. The shallow monitoring well are screened in the sand and fill dominated soils in the near surface materials; the piezometers are screened in the underlying clay till. The hydraulic conductivity of the near surface material is orders of magnitude higher than the clay (as discussed below).

4.2.1.1 Groundwater Flow

Well measurements collected through 2020 indicate the water table generally occurs between two and seven feet bgs and review of the groundwater depth and elevation measurements. Typically, the shallow water table contours indicate radial groundwater flow toward both rivers (Figure 14a) while groundwater levels in the piezometers indicates a flow towards the East River (to the east-northeast) (Figure 15a). United States Army Corps of Engineers (USACE) river stage data gathered during the 1995 Phase II Environmental Investigation Report (NRT 1995) found the shallow water table generally fluctuated in accordance with river stage. Groundwater elevations in the monitoring wells and piezometers ranged between approximately 576 and 583 feet NAVD88 and from approximately 554 and 573 feet NAVD88, respectively, during the Phase II investigation (Completion Report, NRT 2014). The most recent May 2020 groundwater monitoring event captured a rare flow reversal as indicated by increased river elevations and groundwater flowing from the East River south toward the former MGP site (Figure 14b). The potentiometric surface in the clay till was also affected with heads converging towards wells MW405B and MW409B. Horizontal groundwater gradients have been calculated to be 0.0015 and 0.0025 ft/ft.

4.2.1.2 Aquifer Characteristics

During the RI, slug tests were performed on monitoring wells MW-402R, MW-403R, MW-406, MW-408, MW-410, MW-411AR, MW-412, MW-414, MW-415A, and MW-416. The slug tests consisted inserting or removing a solid slug and recording changes in water levels over time. Data was analyzed using the Bouwer-Rice method which yields hydraulic conductivity estimates under unconfined aquifer conditions (Bouwer & Rice, 1976). Hydraulic conductivity values at the wells, ranged from approximately 1×10^{-4} to 8×10^{-1} centimeter per second (cm/s). These results are within and above the range of previous observations from shallow wells which span from 2×10^{-4} cm/s to 1×10^{-3} cm/s. No new tests were completed in the clay wells, which had previously reported hydraulic conductivity values that range from approximately 7×10^{-7} cm/s to 4×10^{-6} cm/s. Previous reports also indicate the groundwater flow velocities in shallow wells is approximately 1 to 18 feet per year while the estimated values for the deeper clay unit range from 0.01 to 0.1 feet per year. These results will be discussed in greater detail in the RI Report.

Vertical hydraulic gradients (Table 6) observed between the water table and clay monitoring wells are strong downward gradient at well nests MW-401AR/B, MW-405A/B, MW-409A/B,

MW-411AR/B and MW-415A/B ranging from 0.03 to 0.38 ft/ft over the last four years. The low hydraulic conductivity values in the clay till and strong downward gradients indicate there is little flow in the clay till that underlies the Site (i.e., the clay till behaves as an aquitard). This is supported by the lack of groundwater impacts observed in the clay wells, as discussed below.

4.2.2 Groundwater Quality and Trends

Samples were not collected from MW-401AR or MW-405A during the RI, due to the presence of residual NAPL in the wells. As presented in the 2003 Remedial Action Work Plan which was approved by WDNR, some NAPL in clay fractures would remain on site and specifically states: "Other outlying and possible deeper areas exist which indicate the presence of coal tar in clay fractures which are not targeted for excavation." The top of clay is too shallow in these areas to install a 10-foot well screen without partially screening into the top of clay till, including intervals where tar was observed in clay fractures at MW-401AR and MW-405A (Figure 9d). The thickness of NAPL observed in these wells has been stable between 1 and 2 feet at MW-401AR, and between 0.5 and 1 foot at MW-405A.

As presented in PDI Work Plan Revision 1 Response to Comment 10 (Ramboll 2020). Prior to 2003 Remedial Action, DNAPL was observed in MW-401AR, MW 402, MW-403, MW-404, and MW-411A. Since then, DNAPL observations have been reduced to only two wells (MW-405A and MW-401AR). The last and most recent observations from MW-402R were strong odors, but no observed NAPL. The reduction in NAPL observations and stable groundwater concentrations indicate source removal was an effective remedy; and, there are no longer any indications of source material and instead indicates the presence of residual NAPL.

Groundwater concentrations in clay wells MW-401BR, MW-405B, MW-407B, MW-409B, MW-411B, and MW-415B (Tables 8a and 8b) have not exceeded a PVOC or naphthalene groundwater SL since 2004. Benzo(a)pyrene, benzo(b)fluoranthene, and chrysene are the only PAHs to exceed the groundwater SL during the last 8 events in these wells. With the exception of a few manganese exceedances, no inorganics have been observed greater than the groundwater SL in these clay wells during the last 8 rounds either. These results demonstrate that the vertical limit of groundwater impacts is defined; and, primary groundwater impacts occur within the shallow sand and fill material above the clay till aquitard.

4.2.2.1 PVOC Concentrations

Benzene is the most frequent petroleum volatile organic compound (PVOC) to exceed the groundwater SL or Wisconsin PAL (Table 7). Other PVOCs to exceed these standards are ethylbenzene, toluene, total xylene and total trimethylbenzene which are all coincident with benzene (Table 8b). PVOC exceedances illustrated by the benzene plume map (Figure 16) are primarily located beneath the former MGP Site and the southern parking lot area. A second area of benzene exceedances in groundwater is observed at MW-411AR. Both plumes are well defined by the monitoring well network and have been stable in extent as illustrated by the annual isoconcentration lines from 2004 through 2020.

Wells were separated into three categories on Figures 16, 17, and 18: low, intermediate, and high concentrations for each constituent. These designations are not indicative of current concentrations, but rather the historic high concentrations at each well. Time series graphs are not presented for wells with greater than 50% non-detect values.

4.2.2.2 PAH Concentrations

Benzo(a)pyrene, benzo(b)fluoranthene, and chrysene are the most common PAH compounds to exceed the groundwater SL or Wisconsin PAL (Table 7). Naphthalene is the next most common, followed by anthracene, fluoranthene, fluorene, phenanthrene, and pyrene. Naphthalene exceedances, as a common indicator of MGP related impacts are illustrated on Figure 17. Unlike the benzene plume map, naphthalene groundwater impacts are only observed beneath the footprint of the former MGP in the southern parking lot area. Like the benzene plume map, the naphthalene plume is well defined and has been stable in extent as illustrated by the annual isoconcentration lines from 2004 through 2020.

Benzo(a)pyrene exceedances are illustrated on Figure 18. Like benzene and naphthalene groundwater exceedances are present beneath the former MGP site and the southern parking lot area. Unlike benzene and naphthalene plume maps exceedances also extend north and east towards the East River. The plume is well defined and stable in extent as illustrated by the annual isoconcentration lines from 2004 through 2020.

4.2.2.3 Inorganic Compound Concentrations

Groundwater samples collected from the monitoring wells were analyzed for dissolved metals, consisting of arsenic, barium, cadmium, chromium, iron, lead, manganese, nickel, selenium, silver, and zinc. Groundwater was analyzed for available cyanide using EPA Method OIA-1677. Iron and manganese were also included in the RI sampling events as indicators of biological activity associated with natural attenuation. The inorganic compounds methane, nitrogen (NO2 + NO3), and sulfate were also monitored as natural attenuation parameters and are discussed in the section below.

Arsenic, barium, cadmium, chromium, iron, lead, manganese, selenium, cyanide, nitrogen, and sulfate had exceedances of the Wisconsin PAL. Of those parameters, arsenic, barium, cadmium, lead, manganese, and cyanide also had exceedances of the groundwater SL. Manganese (an indicator parameter of monitored natural attenuation) was the most commonly observed compound to exceed the groundwater SL with 268 (Table 7). The rest of the compounds except cyanide were detected 20 times or less out of over 400 samples collected. Cyanide has been measured using several different analytical methods over the years. The selected sampling method for the RI was cyanide, available (OIA 1677 method). Of the 166 samples collected none of them exceeded the groundwater SL which is why testing was discontinued following completion of the last quarterly sampling event in December 2016.

4.2.2.4 Monitored Natural Attenuation Parameters

Review of MNA parameters from the last 8 rounds of data (Table 10) indicate a reducing environment is present with anaerobic degradation occurring through methanogenesis within the plume. Chemically, the process of anaerobic respiration involves (in order): 1) denitrification; 2) sulfate reduction; 3) iron reduction; 4) manganese reduction, and 5) methanogenesis.

Typically, if reducing conditions are present beneath a site, the following will be observed:

- DO will typically be less than 0.5 mg or lower than DO readings in unaffected groundwater.
- Nitrate and sulfate concentrations will be lower than areas of unaffected groundwater.
- Iron and manganese are reduced and concentrations in groundwater will increase, as the reduced forms of these compounds have greater solubility than do the oxidized forms.

- Methane concentrations will increase as methanogenesis occurs.
- Alkalinity will increase with increased CO2 released during biodegradation
- ORP of groundwater generally ranges from about 800 millivolts to -400 millivolts; the lower the redox potential, the greater the potential for a reducing and anaerobic environment.

Groundwater samples were analyzed for several MNA indicators including dissolved iron, dissolved manganese, methane, nitrate/nitrite, sulfate, DO, and Oxidation Reduction Potential. Arsenic concentrations in groundwater may also increase, as it responds to redox conditions in the same way as iron and manganese. Concentrations of MNA indicators parameters from wells inside the plume are compared to wells outside the plume on Table 10. Positive indicators of natural attenuation processes were observed for arsenic, nitrogen, DO, and ORP with supporting indications from iron, manganese, and methane.

To further evaluate the potential for monitored natural attenuation within the groundwater during the 2020 PDI, stable isotope probing (SIP) biotraps supplied by Microbial Insights, Inc. (Microbial Insights) will be deployed in groundwater monitoring wells exhibiting groundwater standards exceedances for benzene, naphthalene, and benzo(a)pyrene according to the standards set by Microbial Insights Bio-Trap – Stable Isotope Probing Protocol. The biotrap analysis will be naphthalene and benzene specific. Biotraps will be deployed at four monitoring wells (MW 402R [or its replacement MW 402R2], MW-404, MW-403R, and MW-405A) in the vicinity of the former MGP structures.

4.2.2.5 Benzene, Naphthalene, and Benzo(a)pyrene Trends

Groundwater concentration trend plots were prepared for shallow groundwater wells using the $\log_{10}$ of both detects and "non-detect" concentrations (the full reporting limit was used when plotting non-detects) observed between 2003 (post upland removal action) and 2020. The 95% confidence limits (upper and lower) for the regression line were plotted to provide an additional indicator of correlation either between concentration and time or concentration and groundwater elevation. Coefficient of determination (R^2) was calculated for each data set to further evaluate how well the regression line represented the data. General trends were determined as follows:

- If the absolute value of the slope of the regression line was <0.0001 (10^{-4}), the trend was identified as flat (generally stable).
- If the absolute value of the slope of the regression line was > 10^{-4} and the slope was positive, the trend was identified as increasing.
- If the absolute value of the slope of the regression line was > 10^{-4} and the slope was negative, the trend was identified as decreasing.

Trends are summarized on Table 11 and the plots are included in Appendix 2. Trends on Table 11 are color coded to match concentration vs time graphs presented on the isoconcentration maps (Figures 16, 17, and 18). Review of the trend analyses indicate stable (flat) or decreasing concentrations in all wells for benzene and naphthalene. Benzo(a)pyrene concentrations are also stable or decreasing with the exception of increasing trends at MW-406, MW-408, and MW-409A. In general there is a wide range in the relative strength of the trends observed as indicated by the coefficient of determination values (e.g., benzene has a high R^2 value of 0.7751 at MW-404 indicating a strong correlation between decreasing concentration and time; while benzene has a very low R2 value of 0.00001 at MW-408 indicating an insignificant correlation between concentration and time).

The relative strength of trends between groundwater elevation and concentration for benzene, naphthalene, and benzo(a)pyrene varies between 0.4133 to 0.0004 with most values below 0.2 indicating groundwater elevation generally does not correlate with concentration in groundwater. However, in wells with increasing trends of benzo(a)pyrene the correlation between concentration and groundwater ranges between 0.2939 and 0.1477, which is higher than the correlations for benzene and naphthalene, which range from 0.1645 to 0.0004. Indicating benzo(a)pyrene concentrations in wells with increasing trends are more sensitive to changes in groundwater elevation.

4.3 Soil Vapor

This section summarizes soil gas, sub-slab, and ambient air analytical results. Soil Gas analytical results compared to industrial and residential screening levels are presented on Table 12. Indoor air and ambient air analytical results compared to industrial and residential screening levels are presented on Table 13. Soil gas results and the benzene in groundwater vapor intrusion screening level (VISL) isoconcentration line are presented on Figure 19.

Benzene, ethylbenzene, and naphthalene were detected in soil gas and/or sub-slab samples at concentrations that exceed either a residential or industrial SL (Table 12). Oil wetted material was observed between 4 and 10 feet below ground surface in the soil boring at SG401 (Table 2). Benzene was observed above the residential and industrial screening levels during August and February sampling events. Ethylbenzene and naphthalene were observed above the industrial and residential SLs during an August sampling event, but not the February event. The only other industrial SL exceedance occurred at a sub-slab sample (SS405A) in the storage shed referred to as the "Butler Building" on Figure 19. Ethylbenzene exceeded the industrial SL during the February sampling event, and then was below both industrial and residential screening levels during an August event. Sub-slab sample SS405B was the only other soil gas sampling location to have an exceedance of ethylbenzene. Naphthalene was detected above the residential SL during August sampling events and below the residential SL during February events at SG402, SG404, SG406, SG407, SG408, SG411 indicating naphthalene vapors are more mobile during the warmer months. Naphthalene was the most frequently detected parameter above an SL with 13 of 24 samples exceeding the residential SL.

None of the indoor air samples collected within the Annex building exceeded industrial SLs. Naphthalene was detected above the residential SL at indoor air location (IA1) in August of 2016. Note that the purpose of indoor air sampling was to compare air quality to current use (industrial) therefore the target reporting limit was 0.36 microgram per cubic meter (ug/m^3) which is higher than the residential SL of 0.083. One of the ambient air samples (AMB1, 8/6/16) and two of the indoor air samples (IA1, 8/6/16 and IA2, 8/6/16) had reporting limits that were slightly above the industrial SL.

To visualize the groundwater to vapor pathway, the concentration of benzene (the parameter with the highest observed soil gas concentration) in groundwater was plotted as an isoconcentration line using the residential groundwater to vapor SL (Figure 19) with a 35 foot buffer to identify structures that may need additional evaluation. Soil gas, sub-slab, and indoor air samples were collected adjacent to, or beneath all of the buildings that are within the 35-foot buffer. The results of the vapor intrusion testing conducted in accordance with the Vapor Intrusion Investigation Decision Matrix discussed in Section 3.5 indicate the industrial risk pathway is incomplete for all structures within the 35-foot buffer, including the Annex building which required indoor air samples.

5. REFINED CSM AND PRELIMINARY RISK ASSESSMENT

This section summarizes a refinement of the preliminary conceptual site model (CSM) completed at the time the SSWP was developed and the preliminary results of the human health risk assessment for the upland area of the site. This preliminary risk evaluation was performed prior to the results of the PDI becoming available. The results of the PDI will be incorporated into the baseline risk assessment as appropriate as part of the RI report.

5.1 Refined CSM

The CSM is a diagram and accompanying narrative that present the potential source(s) of impacts, media of concern, potential receptors, and exposure pathways. The preliminary CSMs, presented in the USEPA-approved SSWP, Rev 1 (NRT, 2015a), were developed based on available pre-RI data presented in the Completion Report (NRT, 2014). The preliminary CSM was used to identify potential data gaps to be evaluated in the RI. As additional data became available during the RI, the CSM was updated and refined. The refined-RI CSM for the upland area is presented in Figure 20 and a graphical CSM is presented in Figure 21. Potential exposures and risks associated with surface water and sediment of the Fox and East Rivers adjacent to the upland area of the site are being covered in a separate Remedial Investigation Report for the former Green Bay Sediments (OU2) and so are not discussed herein.

MGP residuals and NAPL were released during historic operation of the former MGP. Approximately 20,951 tons of soil were removed in 2003, thermally treated, replaced as backfill in excavations (i.e., Areas 1,2, 3 and 4), and a cap maintenance plan was established for the site. In 2018, riverbank shoreline soils were removed from the South Focus Area in the East River. 1,245 cubic yards of shoreline material was removed in front of the sheet pile wall installed to support Upland Area 3 excavation. Soils containing visually identified DNAPL were removed and replaced with 0.1 acres of clean gravel. Data collected during the RI and previous investigations indicate residual NAPL and contamination remain above screening levels in soil, soil gas, and groundwater. The conceptual way that human receptors may potentially be exposed to environmental media are discussed in context below within the preliminary human health risk evaluation. Based on the habitat assessment conducted as part of the SSWP, the upland area of the site does not provide habitat for ecological receptors and so no conceptual exposure evaluation or preliminary ecological risk evaluation was performed.

5.2 Preliminary Risk Evaluation Activities

A BLRA for the OU1 will be completed by Exponent and submitted with the RI Report, in conformance with the RAF, Rev 0 (Exponent, 2007), and subsequent addenda. A preliminary human health risk evaluation was performed to provide perspective on potential risks associated with soil, soil gas, and groundwater; this serves to determine if data were sufficient for completing the BLRA. The southern portion of the cap maintenance area was evaluated to address agency concerns that soil data may not be sufficient to delineate MGP related impacts in this area. The preliminary exposure and risk evaluation for each medium is summarized below.

5.2.1 Soil – Human Exposure and Risk Potential

Under current site conditions there is little to no potential for human exposure to soil at the site because it is a commercial office complex. As such, the site area is largely covered by buildings, concrete walkways, and asphalt pavement. In the parking lots there are grass medians, and

there are grass lawns around buildings, and along the river walkway along the East and Fox Rivers. The grass lawn areas are well maintained and prevent, for all practical means, exposure to soil by commercial workers or visitors to the site including the river walkway. The only human receptors that would have potential exposure to soils under current conditions are construction workers that may need to perform intrusive activities in portions of the site for maintenance reasons or as part of a construction project.

Intrusive activities in most areas of the site are controlled by a cap maintenance plan. Figure 5 shows the boundary of the cap maintenance area. Within the cap maintenance area there are four discrete areas (1 through 4) where excavations were backfilled with treated soil in 2003 following thermal treatment of the soils after remediation. These backfilled excavation areas are under an asphalt cap (i.e., parking lot) or concrete walkway and manicured lawn for the northern end of Excavation Area 3 and the shoreline removal area between Excavation Area 3 and the East River. Beyond the boundaries of the backfilled excavation areas, no active remediation has occurred, and in specific locations and depths NAPL remains. The cap maintenance plan is an institutional control that currently prevents activities that could expose people to the MGP impacted soils (including NAPL) that remain within the cap maintenance area. Areas that are outside the cap maintenance area include the Riverwalk area, the office buildings, and a parking lot east of the former MGP site. In specific areas outside the cap maintenance area there are still MGP impacts including NAPL below the ground surface.

Because the future site land use is not known, this preliminary soil risk evaluation examines three possible soil exposure scenarios including: 1) continued use of the site as a commercial/industrial area, 2) residential redevelopment, and 3) construction work associated with either commercial/industrial or residential development at the site. Exposure to soil in the cap maintenance area was evaluated in the event that institutional controls placed on the site were removed or ignored. In addition, the potential for exposure to NAPL is discussed qualitatively based on observations of where NAPL is located. (NAPL is not represented by chemical measurements used to perform the soil risk calculations.)

A summary of the COPC, constituents of concern (COC), and soil risks are provided in Table 14 by exposure scenario. For purposes of this preliminary risk evaluation COPCs are chemicals that have a maximum concentration in an environmental medium (e.g., soil) that exceeds a target cancer risk of 1×10^{-6} or a target noncancer risk (defined by a hazard quotient [HQ]) of 1.0. When risks are above the upper end of the risk management criteria then we call out specific chemicals as COC. Any COPC that has a risk above the upper risk management criteria (i.e., cancer risk greater than 10^{-4} or HI > 1) for the given scenario is defined as a COC. An individual chemical, however, may be considered a COC even if its cancer risk is $<1x10^{-4}$ or its noncancer risk is <1 if it contributes substantially to a cumulative risk estimate that is above a regulatory risk criterion. NAPL is considered to contain COPCs.

The COPC, COC, and risks for soils samples and treated soil samples collected from stockpiles that were placed back into excavations on site are summarized separately in Table 14. The sample-by-sample soil risks are provided for each of the soil samples collected outside excavations (Table 1a, b, and c in Appendix 3) [1] and treated soil samples used as backfill in excavations (Table2a, b, and c in Appendix 3) by exposure scenario (industrial/commercial,

[1] A series of risk driver (RD) tables are also provided for soil samples (refer to Tables RD-1a, b, and c)

construction worker, and residential). The cumulative risks by exposure scenario were estimated considering all analytes detected in soils, rather than just chemicals above SLs.

In soil samples collected outside excavations, the COPC identified based on all three exposure scenarios included carcinogenic PAHs (cPAHs) and NAPL. Other COPC identified based on the residential exposure scenario included arsenic, benzene, ethylbenzene, 2-methylnaphthalene, cyanide, mercury, and xylenes. Based on the construction worker exposure scenario the only other COPC identified was ethylbenzene, and for the industrial/commercial worker exposure scenario, arsenic, benzene, and ethylbenzene. The soil sample risks range from above the upper risk management criteria (i.e., cancer risk greater than 10^{-4} or HI > 1) to below these criteria depending upon the sample location for the three exposure scenarios evaluated (Appendix 3 - Tables 1a, b and c). Considering the soil risks, COC were identified in soil and include cPAHs and NAPL for industrial and construction worker exposure scenarios; and, arsenic, cPAHs, ethylbenzene, 2-methylnaphthalene, cyanide, mercury, xylenes, and NAPL for the residential exposure scenario.

The potential risks associated with treated soil samples used as backfill in excavations after remediation were evaluated separately from the soil samples collected outside excavations. In treated soil samples the only COPC identified included arsenic and cPAHs based on the residential exposure scenario. No COPC were identified based on the construction worker exposure scenario, and only arsenic was a COPC based on the industrial/commercial worker exposure scenario. For the treated soil samples the risks were below the upper risk management criteria (i.e., cancer risk greater than 10^{-4} or HI > 1) in all cases. (Refer to Appendix 3 – Tables 2a, b, and c). In addition, only 2 of 41 treated soil sample based on the residential exposure scenario were above the mid risk management criteria (i.e., cancer risk greater than 10-5 or HI > 1). The areas where the treated soils were used as backfill is shown on Figure 5 in Excavation Areas 1 through 4.[2] Considering the treated soils risks, no COC were identified in the soils used as backfill in any of the excavation areas.

The cumulative soil risks were mapped for the residential exposure scenario because the exposure assumptions used for this scenario result in the highest (most conservative) level of potential soil risk to people. Figures 22, 23, and 24 show soil samples that are above three different risk management criteria ranges based on the residential exposure scenario. The three different risk management criteria ranges include:

- Lower Risk Criteria -Soil samples with residential cancer risk greater than 10^{-6} or HI > 1 (Figure 22)
- Mid Risk Criteria - Soil samples with residential cancer risk greater than 10^{-5} or HI > 1 (Figure 23)
- Upper Risk Criteria -Soil samples with residential cancer risk greater than 10^{-4} or HI > 1 (Figure 24)

[2] The precise location of where each treated pile of soil wound up in an excavation is not known so treated soils pile sample locations could not be mapped. However it is known that treated piles 5, and 7 through 28 were backfilled in the Areas 1 and 2 in the southern portion of the parking lot, and that piles 29, 30 and 32 through 42 were backfilled in Areas 3 and 4 in the northern parking lot.

Also, on these three figures are the locations where NAPL has been observed in subsurface soil. Each of these locations represent a location where risks are potentially above the upper risk criteria.

The soil risks are described by area (i.e., cap maintenance area, Riverwalk area, and other areas) in the context of the risk management criteria presented above.

Cap Maintenance Area - Within the cap maintenance area there are a number of locations where NAPL is present in the subsurface soils and/or risks are above the upper risk criteria (i.e., cancer risk greater than 10^{-4} or HI > 1). Risks from soils in the cap maintenance area were evaluated separately for the northern and southern portions as delineated by the Utility Court (Refer to Figures 22, 23, and 24).

- **Northern portion** - The NAPL observations in this area are as shallow as 1.7 ft bgs (i.e., SB-418A). There are also a number of soil samples within this area with risks above the upper risk criteria based on the residential scenario (Figure 24). In addition, there are samples with NAPL and/or risk above the upper risk criteria are located to the north and west of the capped area.
  - There were no treated soil samples in the northern portion of the capped area with risks above the mid risk criteria that were used as backfill (Refer to Table 2b in Appendix 3).
- **Southern portion** - NAPL is present at some sampling locations but at depths well below 4 ft bgs. A potential NAPL-related exposure concern to construction workers would exist only if they were to perform intrusive activities in these areas. The shallowest NAPL observation in this area was at a depth of 7 feet (i.e., MW-402R) and so is unlikely to be encountered by construction workers. In this area there are soil samples with risks above the upper risk criteria based on the residential scenario.
  - There are no NAPL and/or soil samples with risks above the mid risk criteria to the south, or east of the cap maintenance area (Figure 23). The western limit of the cap maintenance area is the Division Office Building.
  - There were no treated soil samples in the southern portion of the capped area with risks above the upper risk criteria that were used as backfill. In addition, there were only 2 treated soil samples (Refer to Table 2b in Appendix 3) with risks above the mid risk range (i.e., each sample with a risk of $2x10^{-5}$).

Riverwalk Area - Within the Riverwalk area there are two locations where NAPL is present in the subsurface soils (SB-437 and SB-431-2002) and/or residential risks are above the upper risk criteria (EW3-3, SB-437, and SB-438) (Figure 24). The NAPL observations in the Riverwalk area are at depths at or below 4 ft (i.e., 4 to 8 feet at SB-431-2002) (Table 2). Three boring locations (SB-431, SB-432, and SB-433) contained exceedances of the mid risk criteria near Excavation Area 3. The residential risks above the upper and mid risk criteria are within the areas of the ongoing PDI investigation. There were no treated soil samples in the Riverwalk area (i.e., Excavation Area 3) with risks above the upper risk criteria that were used as backfill.

Other Areas - In other areas of the site (i.e., areas west, east and south of cap maintenance area) there were no observations of NAPL. With the exception of one soil sample adjacent to the Annex building (SB-418L) there were no samples with risks above the upper risk criteria (Figure 24). This single sample is adjacent to samples within the cap maintenance area where

NAPL has been observed and soil samples with risks above the upper risk criteria. Within these other areas there are only 2 samples with risk above the mid risk criteria, and both samples are located adjacent to the Annex building (Figure 22). While there are a number of samples above the low risk criteria (Figure 22) many of these samples are above a cumulative cancer risk of $1x10^{-6}$ solely because of arsenic. However, arsenic is at a concentration below the Wisconsin state background criteria of 8 mg/kg (e.g., SB-427).[3]

5.2.2 Groundwater – Human Exposure and Risk Potential

No human receptors are exposed to the groundwater beneath the Site as it is not used as a source of potable water and no intrusive activities are occurring that would bring construction workers into contact with the groundwater. In addition, human exposure to groundwater is not expected in the future for either residential or commercial uses. However, construction workers might come into contact with contaminated groundwater during a construction project. Contact with NAPL associated with groundwater would pose a potential health concern to construction workers.

The drinking water in the area of the site is supplied by the City of Green Bay, which obtains its drinking water from Lake Michigan, which is unaffected by the site. In addition, the City of Green Bay ordinance mentioned in Section 2.2 that will prevent wells from being placed within the site or surrounding area in the future. For this reason, groundwater at the site will not be used as a source of potable water now or in the future. For informational purposes, groundwater quality was compared to groundwater SLs, to address the potential risk associated with use of the groundwater as a domestic water supply for drinking, washing, and bathing.

Based on the groundwater SL exceedances, the shallow drinking water would pose a health concern if it were used as a drinking water source, because chemicals exceed the Federal MCL and/or WDNR NR140 ES.

In addition, as part of the vapor intrusion evaluation, groundwater concentrations were compared to VISLs to determine whether groundwater could be a potential concern for existing buildings or if a building were built in open areas of the Site property in the future. The VI exposure pathway required further evaluation because based on groundwater concentrations, the VI exposure pathway could potentially affect indoor air quality based on the concentrations of benzene detected in site groundwater. For this reason, soil vapor samples were collected above the water table to evaluate in part whether groundwater could be a significant source of chemical vapors that could lead to VI.

5.2.3 Soil Vapor and Indoor Air – Human Health Risk Potential

Soil Vapor samples were collected from utility corridors and soils adjacent buildings as described in Section 3.5 to evaluate if soil vapor could pose a potential concern to indoor air quality of these nearby commercial buildings (Refer to Figure 19 for sample locations).

In accordance with the USEPA approved Vapor Intrusion Decision Matrix discussed in Section 3.5, sub-slab samples were collected from a storage shed (Butler Building) and indoor air and sub samples were collected from an office building (Annex Building) because these commercial

[3] Refer to Table RD-1b of Appendix 3 for the primary chemical risk drivers for each soil sample. A chemical risk driver for a sample is an analyte that contributes substantially (i.e., greater than 15 %) to the cancer or noncancer risk associated with that sample.

buildings were in close proximity to subsurface soil and or groundwater contamination that contained volatile organic chemicals (Figure 19 and Tables 12 and 13). The results of soil vapor, sub-slab, and indoor air sampling indicate that vapor intrusion of soil gas into the commercial buildings at the site does not pose a health concern to commercial workers.

As shown on Figure 19 there were no exceedances of soil gas screening levels (VISLs) or indoor air SLs in the Annex Building samples even though there were benzene and ethylbenzene VISL exceedances at a soil gas sample location (SG401) in the parking lot adjacent to the building.

In the Butler building one of the two sub-slab sample locations (SS405A) had an exceedance of ethylbenzene during the first round of sampling collected in February 2016, but not in the second round of sampling in August 2016. At the other sample location (SS405B) in this building there were no exceedances of the industrial VISLs.

As indicated on Table 12 there are a number of soil gas sample locations with exceedances of residential VISLs indicating that in the future if the land use were to change from commercial to residential that further consideration of the vapor intrusion exposure pathways may need to be incorporated into redevelopment planning.

5.3 Summary of Human Health Risks

Based on this preliminary human health risk evaluation there are no current risk to human receptors except for construction workers who might perform intrusive activities associated with areas where NAPL is present or where soil contamination is above the upper risk criteria. The potential for this is low in most areas of the site because of the cap maintenance area plan that is in place. Currently other media (groundwater and soil gas) do not pose a health concern to humans under current conditions.

In the future, if the site were redeveloped as residential property the primary medium of concern would be soil. In the southern portion of the capped area NAPL is present well below 4 feet limiting risk of NAPL exposure to potential construction workers. There are locations on the site (within and outside the cap maintenance area) where NAPL is present and risks are present above the upper risk management criteria. In these locations exposure to human receptors could pose a potential health concern if, during the redevelopment, the soil contamination was exposed at the surface. Soil COCs identified on Table 14 include cPAHs and NAPL for industrial and construction worker exposure scenarios; and, arsenic, cPAHs, ethylbenzene, 2-methylnaphthalene, cyanide, mercury, xylenes, and NAPL for the residential exposure scenario. Note that no COCs were identified for industrial, commercial, or residential exposure scenarios for the thermally treated soil used as backfill. Based on the presence of volatile contaminants and NAPL in the soil and groundwater, if the site were redeveloped in the future, vapor intrusion would also have to be considered.

6. SUMMARY AND CONCLUSIONS

6.1 Summary

The results of the RI met the objectives of the approved SSWP Revision 2 (NRT, 2015a/b), the subsequent VI Technical Memorandum (NRT, 2016b), and provide adequate information to assess the nature and extent of affected media to support the BLRA and the FS for the upland OU.

6.1.1 Observations of NAPL

The horizontal and vertical extent of trace amounts of NAPL within clay fractures south of Utility Court is defined. As presented in the 2003 Remedial Action Work Plan which was approved by WDNR, some NAPL in clay fractures would remain on site and specifically states: "Other outlying and possible deeper areas exist which indicate the presence of coal tar in clay fractures which are not targeted for excavation." The top of clay is too shallow in some areas to install a 10-foot well screen without partially screening into the top of clay till, including intervals where tar was observed in clay fractures at MW-401AR and MW-405A. The thickness of NAPL observed in these wells is stable. The reduction in NAPL observations from 5 wells prior to the 2003 removal action down to 2 wells; and, stable groundwater concentrations indicate source removal was an effective remedy; and, there are no longer any indications of source material and instead indicates the presence of residual NAPL.

NAPL extent in the northern parking lot area is currently being evaluated as part of the PDI and Early Removal Action. The lateral and vertical extent of NAPL in the northern parking lot area was defined by the RI borings and will be refined with the PDI.

6.1.2 Soil

Lateral and vertical extents of MGP indicator parameters benzene and naphthalene in soil are well defined at the Site and generally coincident with former MGP structures, piping runs, and locations with observations of NAPL. There are fewer locations with PVOC exceedances than locations with PAH exceedances at the Site and the PVOC exceedances are co located with the PAHs exceedances. There are fewer exceedances of inorganic constituents in soil than PVOCs or PAHs.

PAH exceedances of residential and industrial SLs are present within the cap maintenance area and the lateral extent the exceedances are defined. Forensic analysis of soil samples collected in October 2015 also indicate PAHs found near the edge of the Site SB-426, HA-402, and HA-405 have sources other than the former MGP Site.

As part of ongoing PDI investigation activities, additional soil samples are being collected from the Riverwalk area and portions of the northern parking lot area.

6.1.3 Groundwater

The horizontal and vertical limit of groundwater impacts is defined; and, groundwater impacts primarily occur within the shallow sand and fill material above the clay till aquitard. Review of MNA parameters from the last 8 rounds of data indicate a reducing environment is present with anaerobic degradation occurring through methanogenesis within the plume. To further evaluate the potential for monitored natural attenuation within the groundwater during the 2020 PDI, SIP biotraps supplied by Microbial Insights will be deployed in groundwater monitoring wells exhibiting groundwater standards exceedances for benzene and naphthalene.

Review of the trend analyses indicate stable (flat) or decreasing concentrations in all wells for benzene and naphthalene. Benzo(a)pyrene concentrations are also stable or decreasing with the exception of increasing trends at MW-406, MW-408, and MW-409A. Benzo(a)pyrene concentrations in wells with increasing trends are more sensitive to changes in groundwater elevation.

6.1.4 Soil Vapor

The results of the vapor intrusion testing conducted in accordance with the Vapor Intrusion Investigation Decision Matrix indicate the industrial risk pathway is incomplete for all structures evaluated, including the Annex building which required indoor air samples.

Naphthalene was detected above the residential SL during August sampling events and below the residential SL during February events at SG402, SG404, SG406, SG407, SG408, SG411 indicating naphthalene vapors are more mobile during the warmer months. Naphthalene was the most frequently detected parameter above an SL in soil gas with 13 of 24 samples exceeding the residential SL.

6.1.5 Preliminary Risk Assessment

Based on the habitat assessment of the site that was conducted as part of the SSWP, the upland area of the site does not provide habitat for ecological receptors and so no conceptual exposure evaluation or preliminary ecological risk evaluation was performed.

Based on the preliminary human health risk evaluation there is no current risk to human receptors except for construction workers who might perform intrusive activities associated with areas where NAPL is present or where soil contamination is above the upper risk criteria. The potential for this is low in most areas of the site because of the cap maintenance area plan that is in place. Currently other media (groundwater and soil gas) do not pose a health concern to humans under current conditions.

In the future, if the site were redeveloped as residential property the primary medium of concern would be soil. In the southern portion of the capped area NAPL is present well below 4 feet limiting risk of NAPL exposure to potential construction workers. There are locations on the site (within and outside the cap maintenance area) where NAPL is present and risks are present above the upper risk management criteria. In these locations exposure to human receptors could pose a potential health concern if during the redevelopment, the soil contamination was exposed at the surface. Soil COCs identified include cPAHs and NAPL for industrial and construction worker exposure scenarios; and, arsenic, cPAHs, ethylbenzene, 2-methylnaphthalene, cyanide, mercury, xylenes, and NAPL for the residential exposure scenario.

Note that no COCs were identified for industrial, commercial, or residential exposure scenarios for the thermally treated soil used as backfill. Based on the presence of volatile contaminants and NAPL in the soil and groundwater, if the site were redeveloped in the future, vapor intrusion would also have to be considered.

6.2 Conclusions

Work completed to date is sufficient to support the HHRA and ERA for completion of the RI Report and BLRA following completion of the Early Removal Action planned to occur late in 2020. Sample data density and coverage are sufficient to characterize potential MGP residuals and other affected media within the Site. Soil and groundwater have been adequately characterized and delineated.

7. REFERENCES

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TABLES

(TABLES 4, 5, 8, 9 PROVIDED SEPARATELY AS EXCEL TABLES)

Table 1. Summary of Planned and Completed Activities
Wisconsin Public Service Corp. - Former Green Bay Manufactured Gas Plant Site
700 North Adams St., Green Bay, Wisconsin
USEPA WIN000509948 / WDNR BRRTS#02-05-000254

Date	Media	Activity	Supplemental	Comments/Deviations
October 2015	Soil	22 Surface Soil Samples	NA	Several borings were extended deeper around SB-418. SB422 moved for fiber optic line.
October 2015	Soil	15 Soil Borings	NA	
October 2015	Soil	9 Soil Borings	Step-Out Borings	Used to delineate DNAPL observed above native clay till
February 2016	Soil	4 Soil Borings	Supplemental VI	4 additional borings between Annex Building and SB-418 area.
July and August 2018	Soil	19 Soil Borings	NA	Used to delineate shoreline removal area
November 2015 February, May, August, and December 2016	Groundwater	Quarterly GW Sampling NAPL Thickness Measurements	NA	Recommended dropping cyanide, arsenic, cadmium, and lead from future analysis
May 2016	Groundwater	Slug Testing	NA	
August 2016	Groundwater	Well Network resurvey	NA	
May and November 2017 May and November 2018 May and November 2019 May 2020	Groundwater	Semi-Annual GW Sampling NAPL Thickness Measurements	NA	
February and August 2016	Soil Gas	11 Soil Gas	NA	SG-408 moved due to fiber optic utility. SG-411 and SG-412 moved due to site use and active utility work. 3 soil gas locations inside of the utility corridor could not be sampled due to water in the lines. Sample locations are shallow, so the utility lines cannot be sampled with vapor probes. There are no buildings in those directions and groundwater is defined; therefore, no futher activities are necessary to evaluate current risk from vapor intrusion.
August 2016	Soil Gas	2 Sub-Slab Probes	NA	
August and December 2016	Indoor Air/Ambient	2 Indoor Air Samples	Supplemental VI	SG-415 could not be installed as proposed due to approximately 18 inches of concrete below the slab. No exceedances of Industrial CR = 10^{-6} for either round, no further evaluation is required.
August and December 2016	Soil Gas	3 Nested Sub-Slab Samples	Supplemental VI	

[U: KLT 8/18/20, C:BGH 9/9/20]

Notes:
CR = cancer risk
DNAPL = dense non-aqueous phase liquid
GW = groundwater
NA = not applicable
NAPL = non-aqueous phase liquid
VI = vapor intrusion

Table 2. Summary of Post-Excavation NAPL Observations
Upland RI Data Summary Report
Wisconsin Public Service Corporation
Former MGP Site - Green Bay
700 N. Adams Steet, Green Bay, WI 54307
BRRTS# 02-05-000254 USEPA# WIN000509948

Location ID	Excavated?	Top of Interval (ft bgs)	Bottom of Interval (ft bgs)	Highest PID Result [1] (ppm)	NAPL Observation (borings with NAPL observations include descriptions of intervals below NAPL observations)	Observation Present?	Oil-Wetted	Oil-Coated	Sheen	Staining	Odor [2] (Strong, Present, Slight, None)	NAPL above Native Clay	NAPL in Native Clay Fissures	Oil coated/ wetted material (remains)	Additional Observations (only listed where NAPL observations were made)
MW-401AR	N	9.0	15.0	4818.0	Oil stained/wetted in fissures. CLAY, brown.	Y	Y	N	N	Y	N	N	Y	Y	Fissured brown CLAY filled with liquid phase tar.
MW-401BR	N	9.0	11.0	95.0	Oil wettedin fissures. CLAY.	Y	Y	N	N	Y	N	N	Y	Y	tar in fractures
MW-402	N	10.0	11.0	7.0	Oil stained/wetted in fissures. CLAY, red.	Y	Y	N	N	Y	N	N	Y	Y	Fissured red CLAY. Oil/tar in fissures
MW-402R	N	7.0	9.0	285.0	Oil stained/wetted in fissures. CLAY, brown.	Y	Y	N	N	Y	N	N	Y	Y	Fissured brown CLAY. Trace weathered tar/NAPL in fissures. Odor @ 8-9'
MW-403R	N	11.0	13.5	730.0	Oil wetted at isolated depth. CLAY, brown, odor.	Y	Y	N	N	N	Present	N	Y	Y	Isolated globule of tar/NAPL - 1/4" dia. @ 11-ft.
MW-404	N	10.0	14.0	95.0	Oil stained/wetted in fissures. CLAY, red, odor.	Y	Y	N	N	Y	Present	N	Y	Y	Fissured red CLAY. Oil/tar in fissures
MW-405B	N	13.0	17.0	11.0	Oil stained in fissures. CLAY, red, odor.	Y	Y	N	N	Y	Present	N	Y	Y	Fissured red CLAY. Weathered/dry oil/tar staining in fissures.
SB-408	N	12.0	17.0	121.0	Oil stained/wetted in fissures. CLAY, red.	Y	Y	N	N	Y	N	N	Y	Y	Fissured red CLAY. Oil/tar in fissures below 13 feet.
SB-412	N	9.0	15.0	162.0	Oil stained/wetted in fissures. CLAY, red.	Y	Y	N	N	Y	N	N	Y	Y	Fissured red CLAY. Oil/tar in fissures.
SB-413	N	14.0	17.0	84.0	Oil stained/wetted in fissures. CLAY, red.	Y	Y	N	N	Y	N	N	Y	Y	Excavated to 14 feet. Fissured red CLAY. Oil/tar in fissures.
SB-418	N	4.0	5.0	1.3	slight odor, oil-wetted in the form of weathered tar-like material with taffy-like texture at bottom of sleeve	Y	Y	N	N	N	Slight	Y	N	Y	trace wood
SB-418A	N	1.7	6.2	359.6	odor, oil-wetted	Y	Y	N	N	N	Present	N	N	Y	5-15% clay, slag, and wood
SB-418A	N	6.2	7.2	218.7	odor, oil-wetted, sheen	Y	Y	N	Y	N	Present	N	N	Y	5-15% clay, slag, and wood
SB-418A	N	7.2	8.2	25.1	odor, oil-wetted	Y	Y	N	N	Y	Present	N	N	Y	5-15% clay, slag, and wood
SB-418C	N	4.8	5.0	--	odor, stained, oil-wetted, weathered tar-like material	Y	Y	N	N	Y	Present	Y	N	N	~50% wood
SB-418C	N	5.0	6.2	--	odor, oil-wetted in the form of weathered tar-like material	Y	Y	N	N	N	Present	Y	N	Y	~50% wood
SB-418C	N	6.2	10.7	237.1	odor, oil-wetted, sheen	Y	Y	N	Y	N	Present	Y	N	Y	~50% wood
SB-418D	N	3.2	6.5	428.5	odor, stained to oil-wetted	Y	Y	N	N	Y	Present	Y	N	Y	trace wood
SB-418D	N	6.5	6.9	see above	strong odor, oil-wetted	Y	Y	N	N	N	Strong	Y	N	Y	wood
SB-418D	N	6.9	7.8	331.2	odor, oil-wetted in the form of trace droplets	Y	Y	N	N	N	Present	Y	N	Y	trace wood
SB-418D	N	10.1	12.8	84.2	strong odor, oil-wetted, sheen	Y	Y	N	Y	N	Strong	Y	N	Y	trace wood
SB-418E	N	7.2	9.0	232.2	strong odor, stained, oil-wetted wood (produces droplets when squeezed)	Y	Y	N	N	Y	Strong	Y	N	Y	trace wood
SB-418E	N	14.3	15.0	1.2	no odor, trace weathered tar-like material in fractures (larger fractures may have droplets of liquid material in center of weathered material)	Y	Y	N	N	N	None	N	Y	Y	none
SB-418F	N	3.8	4.1	254.6	odor, stained, oil-wetted in the form of weathered tar-like material	Y	Y	N	N	Y	Present	Y	N	Y	trace wood
SB-418F	N	4.1	6.2	339.4	odor, oil-coated	Y	N	Y	N	N	Present	Y	N	Y	trace wood
SB-425-1996	N	8.0	11.0	523.0	Oil stained/wetted in fractures. CLAY, red, odor.	Y	Y	N	N	Y	Present	N	Y	Y	Oil/tar in fractures.
SB-431-2002	N	4.0	8.0	--	Oil stained/wetted SAND, odor.	Y	Y	N	N	Y	Present	N	N	Y	SAND with CLAY, emulsified tar, strong odor.
SB-437	N	4.5	4.7	0.8	no odor, oil-wetted weathered tar-like material	Y	Y	N	N	N	None	Y	N	Y	2" wood layer above
SB-437	N	6.5	6.6	0.0	no odor, oil-wetted weathered tar-like material in 1/2-inch lens	Y	Y	N	N	N	None	Y	N	Y	none
SG-401	N	4.0	10.0	15.6	slight odor, oil-wetted	Y	Y	N	N	N	Present	Y	N	Y	trace wood (increasing with depth)
SG-401	N	10.0	10.6	57.1	slight odor, oil-wetted, slight sheen	Y	Y	N	Y	N	Present	Y	N	Y	trace wood

(O: KLT 10/15, C: ANS 1/28/16, C: AGC 2/2/16, E: KLT 2/3/16, BGH 12/11/16)

Notes:
1. Highest PID result is for the noted observation interval.
2. Odor recorded without strength description reported as "present".
-- = Not Recorded
bgs = below ground surface
C = oil-coated
ft = foot/feet
N = no
n/a = not applicable
NAPL = non-aqueous phase liquid
NR = Not Recorded
PID = photoionization detector
ppm = parts per million
Sh = sheen
St = staining
W = oil-wetted
Y = yes

Table 3. Soil Summary Statistics - Samples Exceeding Screening Levels

Upland RI Data Summary Report
Wisconsin Public Service Corporation
Former MGP Site - Green Bay
700 N. Adams Street, Green Bay, WI 54307
BRRTS# 02-05-000254 | USEPA# WIN000509948

Parameter (mg/kg)	Samples Analyzed	Samples Exceeding the DL	Minimum (mg/kg)	Maximum (mg/kg)	Residential Soil SL (mg/kg)	Samples Exceeding Residential SL	Industrial Soil SL (mg/kg)	Samples Exceeding Industrial SL
Petroleum Volatile Organic Compound (PVOC)								
1,2,4-Trimethylbenzene	88	19	0.0611	287	219	1	219	1
Benzene	147	48	0.0285	23.1	1.2	9	5.1	3
Ethylbenzene	147	55	0.0291	841	5.8	8	25	5
Xylenes, Total	147	51	0.017	866	260	2	260	2
Polycyclic Aromatic Hydrocarbons (PAHs)								
1-Methylnaphthalene	118	76	0.0095	365	18	8	73	3
2-Methylnaphthalene	118	76	0.0097	515	240	1	3,000	0
Benzo(a)anthracene	151	114	0.0038	74	1.1	49	21	8
Benzo(a)pyrene	151	111	0.0076	56.9	0.11	82	2.1	42
Benzo(b)fluoranthene	152	104	0.0035	65	1.1	45	21	6
Benzo(k)fluoranthene	151	106	0.0068	86	11	10	210	0
Dibenz(a,h)anthracene	151	61	0.0074	22	0.11	42	2.1	11
Indeno(1,2,3-cd)pyrene	151	98	0.0065	45	1.1	37	21	3
Naphthalene	152	109	0.0099	1,170	2	43	8.6	25
Metals								
Arsenic, Total	115	115	0.48	93.3	8	10	8	10
Lead, Total	115	113	1.6	7,900	400	4	800	4
Mercury, Total	115	108	0.0029	93.6	23	1	350	0
Thallium, Total	6	1	1.4	1.4	0.78	1	12	0
Cyanide								
Cyanide, Amenable	120	76	0.122	1,500	78	3	1,200	1
Cyanide, Total	120	97	0.104	1,500	78	5	1,200	1

[O:MGP 8/7/20, C:SGW 8/12/20, QA:KLT 9/10/20]

Notes:
DL = detection limit
BRRTS = Bureau for Remediation and Redevelopment Tracking System
mg/kg = milligrams per kilogram
MGP = Manufactured Gas Plant
RI = remedial investigation
SL = Screening Level
USEPA = United States Environmental Protection Agency

Screening Levels used on this table were presented in the Multi-Site Risk Assessment Framework (RAF) Addendum Revision 6, issued in August 2017. Since that time, six revisions of the RSLs have been published by EPA through May 2020. As a result of these six revisions, there were no updates to the RSLs necessary for the MGP-related constituents evaluated in this table.

Table 6. Groundwater Elevation Summary (Last 4 Years)

Upland RI Data Summary Report
Wisconsin Public Service Corporation
Former Green Bay Manufactured Gas Plant Site
700 N. Adams Street, Green Bay, WI 54307
BRRTS# 02-05-000254, USEPA# WIN000509948

Well	Date	Predominant Soil Unit Within Well Screen	Shallow or Deep Well	TOC Elevation (ft NAVD88) [1]	Ground Elevation (ft NAVD88) [1]	Well Depth below TOC (feet)	Screen Length (feet)	Top of Screen (ft NAVD88)	Bottom of Screen (ft NAVD88)	Depth to Groundwater from TOC (ft)	Groundwater Elevation (ft NAVD88) [2]	Change in Head (ft)	Change in Distance (ft)	Vertical gradient (ft/ft)	Direction	Field Comments
MW-401AR	12/13/2016	Fill and clay	Shallow	585.77	585.94	13.7	10	581.7	571.7	3.14	**582.63**	11.14	29.07	0.38	downward	
	5/9/2017									2.95	**582.82**	7.59	29.26	0.26	downward	1.1 ft DNAPL
	11/20/2017									3.60	**582.17**	5.91	28.61	0.21	downward	1.5 ft DNAPL
	5/29/2018									3.30	**582.47**	6.63	28.91	0.23	downward	1.2 ft DNAPL
	11/5/2018									3.41	**582.36**	6.68	28.80	0.23	downward	1.5 ft DNAPL
	5/28/2019									3.00	**582.77**	4.29	29.21	0.15	downward	1.3 ft DNAPL
	11/4/2019									2.16	**583.61**	NM	NM	NM	NM	1.85 ft DNAPL
	5/26/2020									3.82	**581.95**	4.20	28.39	0.15	downward	1.45 ft DNAPL
MW-401BR	12/13/2016	Clay	Deep	585.64	586.03	34.6	5	556.1	551.1	14.15	**571.49**					
	5/9/2017									10.41	**575.23**					
	11/20/2017									9.38	**576.26**					
	5/29/2018									9.80	**575.84**					
	11/7/2018									9.96	**575.68**					
	5/28/2019									7.16	**578.48**					area flooded
	11/4/2019									NM	NM					vault flooded, direct sampled
	5/26/2020									7.89	**577.75**					
MW-402R	12/13/2016	Fill and Clay	Shallow	585.06	585.71	12.3	10	582.8	572.8	3.90	581.16					
	5/9/2017									3.76	581.30					
	11/20/2017									3.82	581.24					
	5/29/2018									3.79	581.27					
								Well Paved Over								
MW-403R	12/13/2016	Fill and Clay	Shallow	584.92	585.07	12.8	10	582.0	572.0	4.55	580.37					
	5/9/2017									2.21	**582.71**					
	11/20/2017									3.71	581.21					
	5/29/2018									1.82	**583.10**					
	11/7/2018									2.79	**582.13**					
	5/28/2019									0.88	**584.04**					
	11/4/2019									2.65	**582.27**					
	5/26/2020									1.30	**583.62**					
MW-404	12/13/2016	Clay	Shallow	584.72	584.88	12.4	10	582.1	572.1	3.27	581.45					
	5/9/2017									1.76	**582.96**					
	11/20/2017									2.93	581.79					
	5/29/2018									1.23	**583.49**					
	11/6/2018									2.00	**582.72**					
	5/28/2019									0.86	**583.86**					
	11/4/2019									1.41	**583.31**					
	5/26/2020									1.81	**582.91**					

Table 6. Groundwater Elevation Summary (Last 4 Years)

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Wisconsin Public Service Corporation
Former Green Bay Manufactured Gas Plant Site
700 N. Adams Street, Green Bay, WI 54307
BRRTS# 02-05-000254, USEPA# WIN000509948

Well	Date	Predominant Soil Unit Within Well Screen	Shallow or Deep Well	TOC Elevation (ft NAVD88) [1]	Ground Elevation (ft NAVD88) [1]	Well Depth below TOC (feet)	Screen Length (feet)	Top of Screen (ft NAVD88)	Bottom of Screen (ft NAVD88)	Depth to Groundwater from TOC (ft)	Groundwater Elevation (ft NAVD88) [2]	Change in Head (ft)	Change in Distance (ft)	Vertical gradient (ft/ft)	Direction	Field Comments
MW-405A	12/13/2016			583.58	583.78	12.7	10	581.0	571.0	3.37	580.21	4.05	24.15	0.17	downward	
	5/9/2017									2.90	580.68	5.04	24.62	0.20	downward	0.6 ft DNAPL
	11/20/2017									2.50	**581.08**	2.47	25.02	0.10	downward	0.66 ft DNAPL
	5/29/2018									2.75	580.83	3.87	24.77	0.16	downward	0.5 ft DNAPL
	11/6/2018	Clay	Shallow							2.87	580.71	3.60	24.65	0.15	downward	0.5 ft DNAPL
	5/28/2019									2.32	**581.26**	5.13	25.20	0.20	downward	0.56 ft DNAPL
	11/4/2019									2.66	580.92	0.76	24.86	0.03	downward	0.95 ft DNAPL
	5/26/2020									2.25	**581.33**	4.48	25.27	0.18	downward	0.76 ft DNAPL
MW-405B	12/13/2016			583.31	583.73	30.1	5	558.6	553.6	7.15	**576.16**					
	5/9/2017									7.67	**575.64**					
	11/20/2017									4.70	**578.61**					
	5/29/2018									6.35	**576.96**					
	11/7/2018	Clay	Deep							6.20	**577.11**					
	5/28/2019									7.18	**576.13**					
	11/4/2019									3.15	**580.16**					
	5/26/2020									6.46	**576.85**					
MW-406	12/13/2016			584.71	584.91	12.5	10	582.2	572.2	4.27	580.44					
	5/9/2017									2.49	**582.22**					
	11/20/2017									3.68	581.03					
	5/29/2018									2.38	**582.33**					
	11/6/2018	Sand and Clay	Shallow							2.59	582.12					
	5/28/2019									1.58	**583.13**					
	11/4/2019									2.32	**582.39**					
	5/26/2020									2.25	**582.46**					
MW-407	12/12/2016			584.95	585.32	12.3	10	582.6	572.6	4.55	580.40					
	5/8/2017									4.10	580.85					
	11/20/2017									4.35	580.60					
	5/29/2018									3.95	581.00					
	11/5/2018	Silty Clay	Shallow							4.07	580.88					
	5/28/2019									3.51	581.44					
	11/4/2019									3.44	581.51					
	5/26/2020									2.91	582.04					
MW-408	12/13/2016			583.55	583.74	12.7	10	580.7	570.7	3.44	580.11					
	5/8/2017									1.89	**581.66**					
	11/20/2017									2.76	**580.79**					
	5/29/2018									1.56	**581.99**					
	11/6/2018	Clay	Shallow							1.86	**581.69**					flooded, potential surface water infiltration
	5/28/2019									0.31	**583.24**					
	11/4/2019									1.41	**582.14**					
	5/26/2020									0.68	**582.87**					

Table 6. Groundwater Elevation Summary (Last 4 Years)

Upland RI Data Summary Report
Wisconsin Public Service Corporation
Former Green Bay Manufactured Gas Plant Site
700 N. Adams Street, Green Bay, WI 54307
BRRTS# 02-05-000254, USEPA# WIN000509948

Well	Date	Predominant Soil Unit Within Well Screen	Shallow or Deep Well	TOC Elevation (ft NAVD88) [1]	Ground Elevation (ft NAVD88) [1]	Well Depth below TOC (feet)	Screen Length (feet)	Top of Screen (ft NAVD88)	Bottom of Screen (ft NAVD88)	Depth to Groundwater from TOC (ft)	Groundwater Elevation (ft NAVD88) [2]	Change in Head (ft)	Change in Distance (ft)	Vertical gradient (ft/ft)	Direction	Field Comments
MW-409A	12/12/2016	Sand and Clay	Shallow	583.75	584.10	12.4	10	581.6	571.6	3.58	580.17	6.91	23.51	0.29	downward	
	5/8/2017									2.25	581.50	7.31	24.84	0.29	downward	
	11/20/2017									3.16	580.59	4.76	23.93	0.20	downward	
	5/29/2018									2.48	581.27	6.68	24.61	0.27	downward	
	11/6/2018									3.01	580.74	4.38	24.08	0.18	downward	
	5/28/2019									0.89	**582.86**					
	11/4/2019									2.20	581.55					
	5/26/2020									0.69	**583.06**					
MW-409B	12/12/2016	Clay	Deep	583.70	584.05	29.6	5	559.2	554.2	10.44	**573.26**					
	5/8/2017									9.51	**574.19**					
	11/20/2017									7.86	**575.84**					
	5/29/2018									9.11	**574.59**					
	11/7/2018									7.34	**576.36**					
	5/28/2019									8.10	**575.60**					
	11/4/2019									6.99	**576.71**					
	5/26/2020									7.09	**576.61**					
MW-410R	12/12/2016	Fill and Clay	Shallow	584.71	584.98	13.9	10	580.8	570.8	4.51	580.20					
	5/8/2017									4.12	580.59					
	11/20/2017									3.94	**580.77**					
	5/29/2018									2.98	**581.73**					
	11/6/2018									3.26	**581.45**					
	5/28/2019									1.29	**583.42**					
	11/4/2019									2.61	**582.10**					
	5/26/2020									1.80	**582.91**					
MW-411AR	12/12/2016	Fill and Clay	Shallow	585.28	585.53	13.5	10	581.4	571.4	4.14	581.14	6.57	24.93	0.26	downward	
	5/8/2017									2.79	**582.49**	6.96	26.28	0.26	downward	
	11/20/2017									3.83	**581.45**	4.48	25.23	0.18	downward	
	5/29/2018									2.78	**582.50**	5.71	26.29	0.22	downward	
	11/6/2018									3.35	**581.93**	5.77	25.71	0.22	downward	
	5/28/2019									1.38	**583.90**	-0.88	27.68	-0.03	downward	
	11/4/2019									2.40	**582.88**	4.99	26.67	0.19	downward	
	5/26/2020									1.61	**583.67**	5.02	27.45	0.18	downward	
MW-411B	12/12/2016	Sand and Clay	Shallow	585.18	585.51	31.4	5	558.7	553.7	10.61	**574.57**					
	5/8/2017									9.65	**575.53**					
	11/20/2017									8.21	**576.97**					
	5/29/2018									8.39	**576.79**					
	11/7/2018									9.02	**576.16**					
	5/28/2019									0.40	**584.78**					vault flooded, water in well turbid
	11/4/2019									7.29	**577.89**					
	5/26/2020									6.53	**578.65**					

Table 6. Groundwater Elevation Summary (Last 4 Years)

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Wisconsin Public Service Corporation
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Well	Date	Predominant Soil Unit Within Well Screen	Shallow or Deep Well	TOC Elevation (ft NAVD88) [1]	Ground Elevation (ft NAVD88) [1]	Well Depth below TOC (feet)	Screen Length (feet)	Top of Screen (ft NAVD88)	Bottom of Screen (ft NAVD88)	Depth to Groundwater from TOC (ft)	Groundwater Elevation (ft NAVD88) [2]	Change in Head (ft)	Change in Distance (ft)	Vertical gradient (ft/ft)	Direction	Field Comments
MW-412	12/12/2016			587.69	587.86	12.7	10	585.0	575.0	7.63	580.06					
	5/8/2017									6.32	581.37					
	11/20/2017									6.97	580.72					
	5/29/2018									6.09	581.60					
	11/5/2018	Sand and Clay	Shallow							6.46	581.23					
	5/28/2019									5.06	582.63					
	11/4/2019									5.58	582.11					
	5/26/2020									4.75	582.94					
MW-413	12/12/2016			586.18	586.45	12.7	10	583.3	573.3	5.20	580.98					
	5/8/2017									3.86	582.32					
	11/20/2017									5.07	581.11					
	5/29/2018									4.02	582.16					
	11/6/2018	Sand and Clay	Shallow							4.53	581.65					
	5/28/2019									2.42	**583.76**					
	11/4/2019									3.51	582.67					
	5/26/2020									2.68	**583.50**					
MW-414	12/13/2016			585.29	585.65	12.6	10	582.6	572.6	4.92	580.37					
	5/9/2017									4.64	580.65					
	11/20/2017									5.17	580.12					
	5/29/2018									4.79	580.50					
	11/6/2018	Sand and Clay	Shallow							4.73	580.56					
	5/28/2019									4.01	581.28					
	11/4/2019									4.68	580.61					
	5/26/2020									4.40	580.89					
MW-415A	12/13/2016			583.99	584.23	12.6	10	581.2	571.2	3.74	580.25	4.98	24.27	0.21	downward	
	5/9/2017									2.91	581.08	5.77	25.10	0.23	downward	
	11/20/2017									3.66	580.33	2.97	24.35	0.12	downward	
	5/29/2018									2.96	581.03	4.54	25.05	0.18	downward	
	11/6/2018	Clay	Shallow	583.81	584.23	12.6	10	581.0	571.0	2.98	580.83	2.93	24.85	0.12	downward	See note 3
	5/28/2019									2.19	**581.62**	4.70	25.64	0.18	downward	
	11/4/2019									3.12	580.69	2.73	24.71	0.11	downward	
	5/26/2020									2.45	**581.36**	4.03	25.38	0.16	downward	

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Well	Date	Predominant Soil Unit Within Well Screen	Shallow or Deep Well	TOC Elevation (ft NAVD88) [1]	Ground Elevation (ft NAVD88) [1]	Well Depth below TOC (feet)	Screen Length (feet)	Top of Screen (ft NAVD88)	Bottom of Screen (ft NAVD88)	Depth to Groundwater from TOC (ft)	Groundwater Elevation (ft NAVD88) [2]	Change in Head (ft)	Change in Distance (ft)	Vertical gradient (ft/ft)	Direction	Field Comments
MW-415B	12/13/2016			583.83	584.21	30.3	5	558.5	553.5	8.55	**575.28**					
	5/9/2017									8.51	**575.32**					
	11/20/2017									6.46	**577.37**					
	5/29/2018									7.33	**576.50**					
	11/6/2018	Clay	Deep							5.92	**577.91**					
	5/28/2019									6.90	**576.93**					
	11/4/2019									5.86	**577.97**					
	5/26/2020									6.49	**577.34**					
MW-416	12/13/2016			583.77	584.10	12.6	10	581.1	571.1	3.83	579.94					
	5/9/2017									3.20	580.57					
	11/20/2017									3.82	579.95					
	5/29/2018									3.06	580.71					
	11/6/2018	Clay	Shallow							3.62	580.15					
	5/28/2019									3.04	580.73					
	11/4/2019									3.37	580.40					
	5/26/2020									2.80	580.97					
MW-417	12/12/2016			585.01	585.44	12.5	10	582.3	572.3	5.45	579.56					
	5/8/2017									4.71	580.30					
	11/20/2017									5.36	579.65					
	5/29/2018									4.72	580.29					
	11/5/2018	Sand and clay	Shallow							5.08	579.93					
	5/28/2019									4.22	580.79					
	11/4/2019									4.85	580.16					
	5/26/2020									4.45	580.56					
MW-418	12/12/2016			585.09	585.61	12.7	10	582.4	572.4	6.27	578.82					
	5/8/2017									5.87	579.22					
	11/20/2017									6.44	578.65					
	5/29/2018									5.82	579.27					
	11/5/2018	Clay	Shallow							6.11	578.98					
	5/28/2019									5.13	579.96					
	11/4/2019									5.81	579.28					
	5/26/2020									5.36	579.73					

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Well	Date	Predominant Soil Unit Within Well Screen	Shallow or Deep Well	TOC Elevation (ft NAVD88) [1]	Ground Elevation (ft NAVD88) [1]	Well Depth below TOC (feet)	Screen Length (feet)	Top of Screen (ft NAVD88)	Bottom of Screen (ft NAVD88)	Depth to Groundwater from TOC (ft)	Groundwater Elevation (ft NAVD88) [2]	Change in Head (ft)	Change in Distance (ft)	Vertical gradient (ft/ft)	Direction	Field Comments
SG-01	12/13/2016			584.60	--	--	--	--	--	5.28	579.32					
	5/9/2017									4.57	580.03					
	11/20/2017									4.96	579.64					
	5/29/2018									3.24	581.36					
	11/5/2018	NA	NA							3.52	581.08					
	5/28/2019									2.37	582.23					
	11/4/2019									3.91	580.69					Water level collected on 11/5/2019
	5/26/2020									1.82	582.78					

[SGW/NDK 01/13_SGW/JJW 01/14_NDK/EPK 08/14][U:ECK 3/4/15][U:KJS 12/5/16][U: ANS 1/4/16, C: KJS/EDP 1/5/17] [U: JQW 12/11/18, C: KLT 12/11/18][U: KLT 7/29/20, C:KJS 7/30/20]

Notes:

1. Well TOC, ground surface, and cover elevations of monitoring well network resurveyed by WPSC on August 26, 2016.
2. Bold face values indicate the water level is higher than the top of the screen for monitoring wells.
3. The TOC at MW-415A was pushed down 0.18 ft on August 2, 2018.

" = inch/inches
DNAPL = Dense Non-Aqueous Phase Liquid
ft = feet
ft/ft = feet per foot
NA = Not Applicable
NAVD88 = North American Vertical Datum of 1988
NM = Not Measured
TOC = Top of Casing

Table 7. Groundwater Summary Statistics - Samples Exceeding Screening Levels

Upland RI Data Summary Report
Wisconsin Public Service Corporation
Former MGP Site - Green Bay
700 N. Adams Street, Green Bay, WI 54307
BRRTS# 02-05-000254 | USEPA# WIN000509948

Parameter (µg/L)	Samples Analyzed	Samples Exceeding the DL	Minimum (µg/L)	Maximum (µg/L)	WI Groundwater SL (µg/L)	Samples Exceeding Groundwater SL	WI Groundwater PAL (µg/L)	Samples Exceeding Groundwater PAL	Tap Water RSL (µg/L)	Samples Exceeding Tap Water RSL	Groundwater VISL, Industrial (µg/L)	Samples Exceeding VISL Industrial	Groundwater VISL, Residential (µg/L)	Samples Exceeding VISL Residential
Petroleum Volatile Organic Compound (PVOC)														
1,2,4-Trimethylbenzene	699	166	0.54	860	NS	0	NS	0	56	89	1,040	0	248	32
1,3,5-Trimethylbenzene	699	93	0.41	270	NS	0	NS	0	60	15	733	0	175	3
Trimethylbenzenes, Total	699	167	0.54	1,130	480	9	96	68	NS	0	NS	0	NS	0
Benzene	700	258	0.17	14,000	5	183	0.5	237	0.46	241	6.9	215	1.6	245
Ethylbenzene	700	206	0.34	1,700	700	10	140	96	1.5	187	15	192	3.5	203
Toluene	700	182	0.17	6,700	800	13	160	30	1,100	13	80,700	0	19,200	0
Xylenes, m + p	700	154	0.93	3,100	NS	0	NS	0	190	42	1,490	6	355	28
Xylene, o	700	181	0.43	2,000	NS	0	NS	0	190	47	2,070	0	492	23
Xylenes, Total	700	180	0.43	5,100	2,000	10	400	45	190	69	1,620	14	385	48
Polynuclear Aromatic Hydrocarbons (PAHs)														
1-Methylnaphthalene	668	437	0.0031	940,000	NS	0	NS	0	1.1	166	NS	0	NS	0
2-Methylnaphthalene	668	399	0.0027	1,000,000	NS	0	NS	0	36	47	NS	0	NS	0
Acenaphthene	668	340	0.0046	36,000	NS	0	NS	0	530	5	NS	0	NS	0
Acenaphthylene	668	378	0.0039	200,000	NS	0	NS	0	530	7	NS	0	NS	0
Anthracene	668	425	0.0047	180,000	3,000	5	600	7	1,800	5	NS	0	NS	0
Benzo(a)anthracene	691	377	0.0041	130,000	NS	0	NS	0	0.03	256	NS	0	NS	0
Benzo(a)pyrene	691	365	0.003	100,000	0.2	141	0.02	302	0.025	283	NS	0	NS	0
Benzo(b)fluoranthene	691	420	0.0034	51,000	0.2	170	0.02	335	0.25	148	NS	0	NS	0
Benzo(g,h,i)perylene	668	363	0.004	43,000	NS	0	NS	0	120	6	NS	0	NS	0
Benzo(k)fluoranthene	691	376	0.0051	60,000	NS	0	NS	0	2.5	37	NS	0	NS	0
Chrysene	691	415	0.0035	120,000	0.2	181	0.02	354	25	19	NS	0	NS	0
Dibenz(a,h)anthracene	691	204	0.0039	13,000	NS	0	NS	0	0.025	144	NS	0	NS	0
Fluoranthene	691	500	0.005	200,000	400	7	80	14	800	6	NS	0	NS	0
Fluorene	668	320	0.0041	170,000	400	7	80	15	290	7	NS	0	NS	0
Indeno(1,2,3-cd)pyrene	691	324	0.0041	33,000	NS	0	NS	0	0.25	108	NS	0	NS	0
Naphthalene	691	520	0.0062	4,200,000	100	110	10	144	0.12	276	20	148	4.6	199
Phenanthrene	668	478	0.0076	400,000	3,000	6	NS	0	1,800	8	NS	0	NS	0
Pyrene	691	521	0.0058	240,000	250	10	50	21	120	13	NS	0	NS	0
Metals														
Arsenic, Dissolved	422	266	0.22	95.9	10	20	1	196	0.052	266	NS	0	NS	0
Barium, Dissolved	407	407	4.2	2,270	2,000	1	400	90	3,800	0	NS	0	NS	0
Cadmium, Dissolved	417	89	0.05	17	5	3	0.5	50	9.2	1	NS	0	NS	0
Chromium, Dissolved	406	151	0.31	33	100	0	10	11	22,000	0	NS	0	NS	0
Iron, Dissolved	506	388	5.5	85,900	NS	0	150	322	14,000	49	NS	0	NS	0
Lead, Dissolved	408	137	0.1	157	15	2	1.5	35	15	2	NS	0	NS	0
Manganese, Dissolved	506	488	0.68	5,740	300	268	60	364	430	215	NS	0	NS	0
Selenium, Dissolved	408	121	0.21	26	50	0	10	17	100	0	NS	0	NS	0
Cyanide														
Cyanide, Amenable	28	15	13	13,000	200	11	40	13	20	14	NS	0	NS	0
Cyanide, Available	166	77	0.51	77	200	0	40	3	20	10	NS	0	NS	0
Cyanide, Available (Preserved)	53	41	0.49	253	200	2	40	6	20	11	NS	0	NS	0
Cyanide, Total	31	29	3	13,000	200	18	40	20	20	25	NS	0	NS	0
Cyanide, Weak Acid Dissociable	31	27	3	540	200	4	40	12	20	16	NS	0	NS	0
Inorganics														
Chloride, Total	1	1	4,860,000	4,860,000	NS	0	125,000	1	NS	0	NS	0	NS	0
Nitrogen, NO2 + NO3, Total	506	244	47	7,800	NS	0	2,000	25	NS	0	NS	0	NS	0
Sulfate, Dissolved	15	15	32,000	1,800,000	NS	0	125,000	11	NS	0	NS	0	NS	0
Sulfate, Total	491	475	1,300	2,800,000	NS	0	125,000	347	NS	0	NS	0	NS	0

[O:MGP 8/11/20, C:SGW 8/12/20, QA:KLT 9/11/20]

Notes:
µg/L = micrograms per liter
DL = detection limit
BRRTS = Bureau for Remediation and Redevelopment Tracking System
MGP = Manufactured Gas Plant
PAL = Preventative Action Limit
RI = remedial investigation
RSL = Regional Screening Level
SL = Screening Level
USEPA = United States Environmental Protection Agency
VISL = Vapor Intrusion Screening Level

Screening Levels used on this table were presented in the Multi-Site Risk Assessment Framework (RAF) Addendum Revision 6, issued in August 2017. Since that time, six revisions of the RSLs have been published by EPA through May 2020. As a result of these six revisions, there were no updates to the RSLs necessary for the MGP-related constituents evaluated in this table.
The Groundwater SL presented is the more conservative of the State and MCL values presented in the RAF Addendum Revision 6.
Groundwater VISLs used on this table are 10-6 risk value.

Table 10. Comparison of MNA Parameters from Selected Inside and Outside Plume Wells (Last 8 Rounds)

Upland RI Data Summary Report

Wisconsin Public Service Corporation

Former MGP Site - Green Bay

700 N. Adams Street, Green Bay, WI 54307

BRRTS# 02-05-000254 USEPA# WIN000509948

	Arsenic, Dissolved (µg/L)	Iron, Dissolved (µg/L)	Manganese, Dissolved (µg/L)	Methane (µg/L)	Nitrogen, NO2 + NO3, Total (µg/L)	Sulfate, Total (µg/L)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (millivolts)
Outside Plume Wells (MW-406, MW-407, MW-408, MW-409A, MW-410R, MW-412, MW-413, MW-414, MW-415A, MW-416, MW-417, MW-418)								
Min	0.42	10.0	1.30	0.66	59.0	2,200	0.00	-268.4
Max	11.2	55,400	5,740	7,560	6,500	1,140,000	4.21	248.3
Average	2.88	10,641	1,173	1,148	487	179,118	0.36	-39.0
Inside Plume Wells (MW-401AR, MW-402, MW-403R, MW-404, MW-405A, MW-411AR)								
Min	**1.40**	**186**	**21.2**	**10.4**	**59.0**	120,000	**0.00**	**-295.5**
Max	**41.8**	7,480	450	155	**430**	2,220,000	**0.53**	**30.6**
Average	**7.31**	2,946	244	76.6	**137**	542,706	**0.18**	**-118.8**

[O: KLT 8/3/20, C: SJM 8/11/20]

Notes:

Observations from the Plume Wells were compared to Outside Plume Wells.

Values that are **bold and underlined** are positive indicators for microbial activity and biodegradation within the plume.

Typically, if reducing conditions are present beneath a site, the following is observed as positive indicatorsof microbial activity and biodegradation:

1. Dissolved Oxygen will typically be less than 0.5 mg or lower than Dissolved Oxygen readings in unaffected groundwater.
2. Nitrate and sulfate concentrations will be lower than areas of unaffected groundwater.
3. Iron and manganese are reduced and concentrations in groundwater will increase, as the reduced forms of these compounds have greater solubility than do the oxidized forms.
4. Methane concentrations will increase as methanogenesis occurs.
5. Oxidation Reduction Potential of groundwater generally ranges from about 800 millivolts to -400 millivolts; the lower the redox potential, the greater the potential for a reducing and anaerobic environment.
6. Arsenic (dissolved) concentrations in groundwater may also increase, as it responds to redox conditions in the same way as iron and manganese.

Table 11. Groundwater Concentration Trends - Benzene, Naphthalene, and Benzo(a)pyrene

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BRRTS# 02-05-000254, USEPA# WIN000509948

Well	Benzene vs. Time		Napthalene vs. Time		Benzo(a)pyrene vs. Time		Benzene vs. Groundwater Elevation	Napthalene vs. Groundwater Elevation	Benzo(a)pyrene vs. Groundwater Elevation
	R^2 (coefficient of determination)	General Trend	R^2 (coefficient of determination)	General Trend	R^2 (coefficient of determination)	General Trend	R^2 (coefficient of determination)	R^2 (coefficient of determination)	R^2 (coefficient of determination)
MW-401AR^	0.2361	Flat	0.0370	Decreasing	0.00028	Flat	0.3671	0.1413	0.0566
MW-402R	0.3604	Flat	0.2767	Decreasing	0.1044	Decreasing	0.0087	0.0351	0.0087
MW-403R	0.06091	Flat	0.00984	Flat	0.5017	Decreasing	0.3855	0.0495	0.1729
MW-404	0.7751	Decreasing	0.9243	Decreasing	0.3937	Decreasing	0.0328	0.1271	0.0155
MW-405A^	0.08007	Flat	0.0528	Flat	0.0524	Decreasing	0.0151	0.2337	0.0611
MW-406	0.02433	Flat	0.4161	Decreasing	0.2746	Increasing	0.0004	0.0000	0.2939
MW-407	0.1942	Flat	0.4326	Decreasing	0.0666	Flat	0.0833	0.1138	0.1213
MW-408	0.00001	Flat	0.4020	Decreasing	0.2816	Increasing	0.0187	0.1645	0.1477
MW-409A	0.05296	Flat	0.2182	Decreasing	0.4657	Increasing	0.0693	0.0102	0.1844
MW-410R	0.1791	Flat	0.2120	Decreasing	0.0004	Flat	0.0003	0.1630	0.0649
MW-411AR	0.00240	Flat	0.1355	Decreasing	0.3204	Decreasing	0.1181	0.4133	0.2883
MW-412	0.00539	Flat	0.3006	Decreasing	0.0004	Flat	0.0377	0.1688	0.0699
MW-413	0.1101	Flat	0.1170	Flat	0.0392	Flat	0.0315	0.1291	0.0171
MW-414	0.00308	Flat	0.1810	Flat	0.0252	Flat	0.0358	0.1487	0.0362
MW-415A	0.00188	Flat	0.2886	Flat	0.1084	Flat	0.00233	0.0131	0.0394
MW-416	0.00604	Flat	0.1274	Flat	0.3282	Decreasing	0.0356	0.0166	0.0408
MW-417	0.02494	Flat	0.2289	Flat	0.0216	Flat	0.00808	0.0541	0.0013
MW-418	0.0496	Flat	0.1523	Flat	0.000073	Flat	0.0234	0.0356	0.00049

[U:AGC 7/14 C:NDK 7/14; U:KJS 12/9/16 C: KLT 8/3/20][U: KLT 8/4/20, C: RAB 8/7/2020]

Notes:

The General Trends are color coded that same as the RI Groundwater Results Figures:

Low | Intermediate | High

1. If -0.0001 < trendline slope < 0.0001 general trend is considered Flat
2. If trendline slope $\leq$ -0.0001 general trend is considered Decreasing
3. If trendline slope $\geq$ 0.0001 general trend is considered Increasing
4. Non-detect results were included in the regression plots using the full reporting limit (e.g., <0.5 = 0.5)
5. Refer to Appendix B for the trend plot graphs.
6. MW408, MW409A, MW410R, and MW413 are flushmounted wells in parking lots that did not have good seals due to frost heave preventing the plug from fitting beneath the lid, this may have resulted in asphalt surface runoff entering the well. Wells were repaired in August 2016.

^Monitoring well contains DNAPL, analytical testing was discontinued

Table 12. Soil Gas Analytical Results Compared to Residential and Industrial SLs

Upland RI Data Summary Report
Wisconsin Public Service Corporation
Former MGP Site - Green Bay
700 N. Adams Street, Green Bay, WI 54307
BRRTS# 02-05-000254 | USEPA# WIN000509948

				VOC		VOC		VOC		VOC		Inorganic		Inorganic		Organic	
9-digit Code	Sample Location	Sample Depth	Sample Date	1,2,4-Trimethylbenzene		Benzene		Ethylbenzene		Naphthalene		Toluene		Xylenes, Total		Carbon Dioxide		Oxygen		Methane	
				µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		mol percent		mol percent		mol percent	
				Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Soil Gas Industrial SL:				**8,760**		**52**		**164**		**12**		**730,000**		**14,600**		**NS**		**NS**		**NS**	
Soil Gas Residential SL:				2,090		12		37		2.8		174,000		3,480		NS		NS		NS	
020416009/020416010 (N)	SG401	4 - 4.5	02/04/2016	2.8		**930**		8.9		0.84		130		42		12.1		3.51	J	4.27	
080516007/080516008 (N)	SG401	4 - 4.5	08/05/2016	46		**12,000**		**410**		**13**		440		820		28.7		2.61	J	23.4	
020316008	SG402	3.5 - 4	02/03/2016	1.9		1.4		7.0		0.58		170		41		1.50		14.4		0.10	U
080516006	SG402	3.5 - 4	08/05/2016	12		7.9		14		11		29		25		8.37		5.74		0.0900	U
020316005	SG403	3.5 - 4	02/03/2016	4.2		1.2		17		0.86		190		94		1.63		15.5		0.10	U
080516003	SG403	3.5 - 4	08/05/2016	1.80	U	1.200	U	1.60	U	1.5		1.50	U	5.8		7.29		9.05		0.0900	U
020316004	SG404	3.5 - 4	02/03/2016	2.9		1.5		21		1.4		170		120		1.66		16.2		0.10	U
080516002	SG404	3.5 - 4	08/05/2016	13		1.100	U	5.4		9.9		15		25		8.94		4.06		0.0900	U
020316001	SS405A	SubSlab	02/03/2016	26		14		**350**		3.8		4,400		1,400		0.08	U	16.7		0.10	U
080616012	SS405A	SubSlab	08/06/2016	160		0.990	U	13		3.0		14		100		0.0600	U	14.9		0.0800	U
020316002	SS405B	SubSlab	02/03/2016	8.4		4.5		86		1.3		1,200		450		0.42		16.9		0.10	U
080616015	SS405B	SubSlab	08/06/2016	13		1.200	U	4.1		3.9		15		23		2.84		11.7		0.1000	U
020416013	SG406	3.5 - 4	02/04/2016	1.700	U	1.6		7.8		0.46	U	100		41		0.12		8.90		0.05	U
080616016	SG406	3.5 - 4	08/06/2016	16		1.100	U	10		8.6		15		54		1.57		13.9		0.0900	U
020416014	SG407	3.5 - 4	02/04/2016	3.6		1.7		6.7		0.50		86		31		0.06		8.89		0.05	U
080616017	SG407	3.5 - 4	08/06/2016	380		1.100	U	3.4		9.5		5.5		46		0.29		14.6		0.0900	U
020316003	SG408	2.5 - 3	02/03/2016	5.6		3.4		26		0.88		270		140		0.51		17.0		0.10	U
080516001	SG408	2.5 - 3	08/05/2016	16		1.10	U	6.2		10		17		28		1.37		12.9		0.0900	U
020316006	SG411	2.5 - 3	02/03/2016	1.9		1.200	U	5.9		0.48		140		33		0.76		16.5		0.10	U
080516004	SG411	2.5 - 3	08/05/2016	1.80	U	1.200	U	1.60	U	4.4		1.40	U	4.90	U	4.77		9.65		0.0900	U
080616018	SS413	SubSlab	08/06/2016	7.4		1.100	U	2.1		1.8		11		11		0.09		14.4		0.0800	U
120416004	SS413	SubSlab	12/04/2016	12		1.7	J	8.1		6.6		27		30		0.11		17.2		0.10	U
080616019	SG413D	3.5 - 4	08/06/2016	7.6		1.100	U	1.9		7.7		6.1		10		6.53		8.99		0.0900	U
120416005/120416006 (N)	SG413D	3.5 - 4	12/04/2016	20		7.2	J	15	J	5.0		190	J	73		4.19		13.6		0.10	U

Table 12. Soil Gas Analytical Results Compared to Residential and Industrial SLs

Upland RI Data Summary Report
Wisconsin Public Service Corporation
Former MGP Site - Green Bay
700 N. Adams Street, Green Bay, WI 54307
BRRTS# 02-05-000254 | USEPA# WIN000509948

				VOC		VOC		VOC		VOC		Inorganic		Inorganic		Organic	
9-digit Code	Sample Location	Sample Depth	Sample Date	1,2,4-Trimethylbenzene		Benzene		Ethylbenzene		Naphthalene		Toluene		Xylenes, Total		Carbon Dioxide		Oxygen		Methane	
				µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		µg/m³		mol percent		mol percent		mol percent	
				Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Soil Gas Industrial SL:				**8,760**		**52**		**164**		**12**		**730,000**		**14,600**		**NS**		**NS**		**NS**	
Soil Gas Residential SL:				2,090		12		37		2.8		174,000		3,480		NS		NS		NS	
080616020	SS414	SubSlab	08/06/2016	4.5		1.200	U	1.60	U	1.7		3.5		5.3		4.67		9.98		0.27	
120416007	SS414	SubSlab	12/04/2016	6.8		1.200	U	2.2		8.4		7.1		9.2		2.28		15.7		0.25	
080616021	SG414D	3.5 - 4	08/06/2016	2.8		1.100	U	1.50	U	1.3		1.4		4.50	U	5.39		10.0		0.0900	U
120416008	SG414D	3.5 - 4	12/04/2016	7.0		1.200	U	5.6		3.3		31		26		3.60		14.2		0.10	U
Total Number of Samples Analyzed:				28		28		28		28		28		28		28		28		28	
Number of Detections:				25		13		24		27		26		26		26		28		4	
Min:				1.9		1.2		1.9		0.48		1.4		5.3		0.06		2.61		0.25	
Max:				380		12,000		410		13		4,400		1,400		28.7		17.2		23.4	
Soil Gas Industrial SL:				8,760		52		164		12		730,000		14,600		NS		NS		NS	
Number of Samples that Exceed Industrial SL:				0		2		2		1		0		0		0		0		0	
Soil Gas Residential SL:				2,090		12		37		2.8		174,000		3,480		NS		NS		NS	
Number of Samples that Exceed Residential SL:				0		3		3		15		0		0		0		0		0	

[O:MGP 8/12/20, C:SGW 8/13/20, C:YMC 8/13/20]

Notes:
Analyte concentration exceeds the standard for:

BOLD	**Soil Gas Industrial SL**
Underline	Soil Gas Residential SL
Pink Highlighting	result exceeds one or more screening criteria
Yellow Highlighting	analyte exceedance in statistics for one or more samples

Lab comments and definitions can be found in associated laboratory and validation reports.

(N) = Normalized sample locations created from combining parent and field duplicate samples following EPA protocol
µg/m³ = micrograms per cubic meter
BRRTS = Bureau for Remediation and Redevelopment Tracking System
J = Estimated Concentration
MGP = Manufactured Gas Plant
NS = No Screening Level
RI = remedial investigation
SL = Screening Level
U = Concentration was not detected above the reported limit
USEPA = United States Environmental Protection Agency
VOC = Volatile Organic Compound

Screening Levels:

Screening Levels used on this table were presented in the Multi-Site Risk Assessment Framework (RAF) Addendum Revision 6, issued in August 2017. Since that time, six revisions of the RSLs have been published by EPA through May 2020. As a result of these six revisions, there were no updates to the RSLs necessary for the MGP-related constituents evaluated in this table.

Table 13. Indoor Air and Ambient Analytical Results Compared to Residential and Industrial SLs

Upland RI Data Summary Report
Wisconsin Public Service Corporation
Former MGP Site - Green Bay
700 N. Adams Street, Green Bay, WI 54307
BRRTS# 02-05-000254 | USEPA# WIN000509948

			VOC		VOC		VOC		VOC		VOC		VOC		Inorganic		Inorganic		Inorganic		Organic	
9-digit Code	Sample Location	Sample Date	1,2,4-Trimethylbenzene		Benzene		Ethylbenzene		Naphthalene		Toluene		Xylenes, Total		Carbon Dioxide		Oxygen		Methane			
Reporting Units:			µg/m^3		µg/m^3		µg/m^3		µg/m^3		µg/m^3		µg/m^3		mol percent		mol percent		mol percent			
			Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag		
Industrial Indoor Air SL:			**263**		**1.6**		**4.9**		**0.36**		**21,900**		**438**		**NS**		**NS**		**NS**			
Residential Indoor Air SL:			63		0.36		1.1		0.083		5,210		104		NS		NS		NS			
080616011	AMB1	08/06/2016	1.90	U	1.30	U	1.70	U	0.51	U	1.50	U	5.10	U	0.0800	U	15.4		0.1000	U		
092216001	AMB1	09/22/2016	1.30	U	0.810	U	1.100	U	0.33	U	1.9		3.30	U	0.08	U	17.7		0.10	U		
120416001	AMB2	12/04/2016	1.20	U	0.760	U	1.00	U	0.31	U	0.89	U	3.10	U	0.08	U	17.9		0.10	U		
080616013	IA1	08/06/2016	1.90	U	1.200	U	1.70	U	0.50	U	1.7		5.00	U	0.0800	U	15.5		0.1000	U		
092216003/092216004 (N)	IA1	09/22/2016	1.30	U	0.860	U	1.100	U	0.35		1.9		3.40	U	0.08	U	17.7		0.10	U		
120416003	IA1	12/04/2016	1.20	U	0.780	U	1.100	U	0.32	U	0.92	U	3.20	U	0.08	U	18.0		0.10	U		
080616014	IA2	08/06/2016	1.80	U	1.200	U	1.60	U	0.47	U	1.7		4.70	U	0.0700	U	15.1		0.0900	U		
092216002	IA2	09/22/2016	1.20	U	0.790	U	1.100	U	0.32	U	1.8		3.20	U	0.08	U	17.6		0.10	U		
120416002	IA2	12/04/2016	1.30	U	0.84	U	1.100	U	0.35	U	1.5		3.40	U	0.08	U	18.3		0.10	U		

[O:MGP 8/12/20, C:SGW 8/13/20, QA:YMD 8/13/2020]

Notes:
Analyte concentration exceeds the standard for:

BOLD	**Industrial Indoor Air SL**
Underline	Residential Indoor Air SL
Pink Highlighting	result exceeds one or more screening criteria
Yellow Highlighting	analyte exceedance in statistics for one or more samples

Lab comments and definitions can be found in associated laboratory and validation reports.

(N) = Normalized sample locations created from combining parent and field duplicate samples following EPA protocol
µg/m^3 = micrograms per cubic meter
BRRTS = Bureau for Remediation and Redevelopment Tracking System
J = Estimated Concentration
MGP = Manufactured Gas Plant
NS = No Screening Level
RI = remedial investigation
SL = Screening Level
U = Concentration was not detected above the reported limit
USEPA = United States Environmental Protection Agency
VOC = Volatile Organic Compound

Screening Levels:

Screening Levels used on this table were presented in the Multi-Site Risk Assessment Framework (RAF) Addendum Revision 6, issued in August 2017. Since that time, six revisions of the RSLs have been published by EPA through May 2020. As a result of these six revisions, there were no updates to the RSLs necessary for the MGP-related constituents evaluated in this table.

Table 14. Summary of Human Health Risk Estimates by Exposure Scenario for Soils

Upland RI Data Summary Report
Wisconsin Public Service Corporation
Former MGP Site - Green Bay
700 N. Adams Street, Green Bay, WI 54307
BRRTS# 02-05-000254 | USEPA# WIN000509948

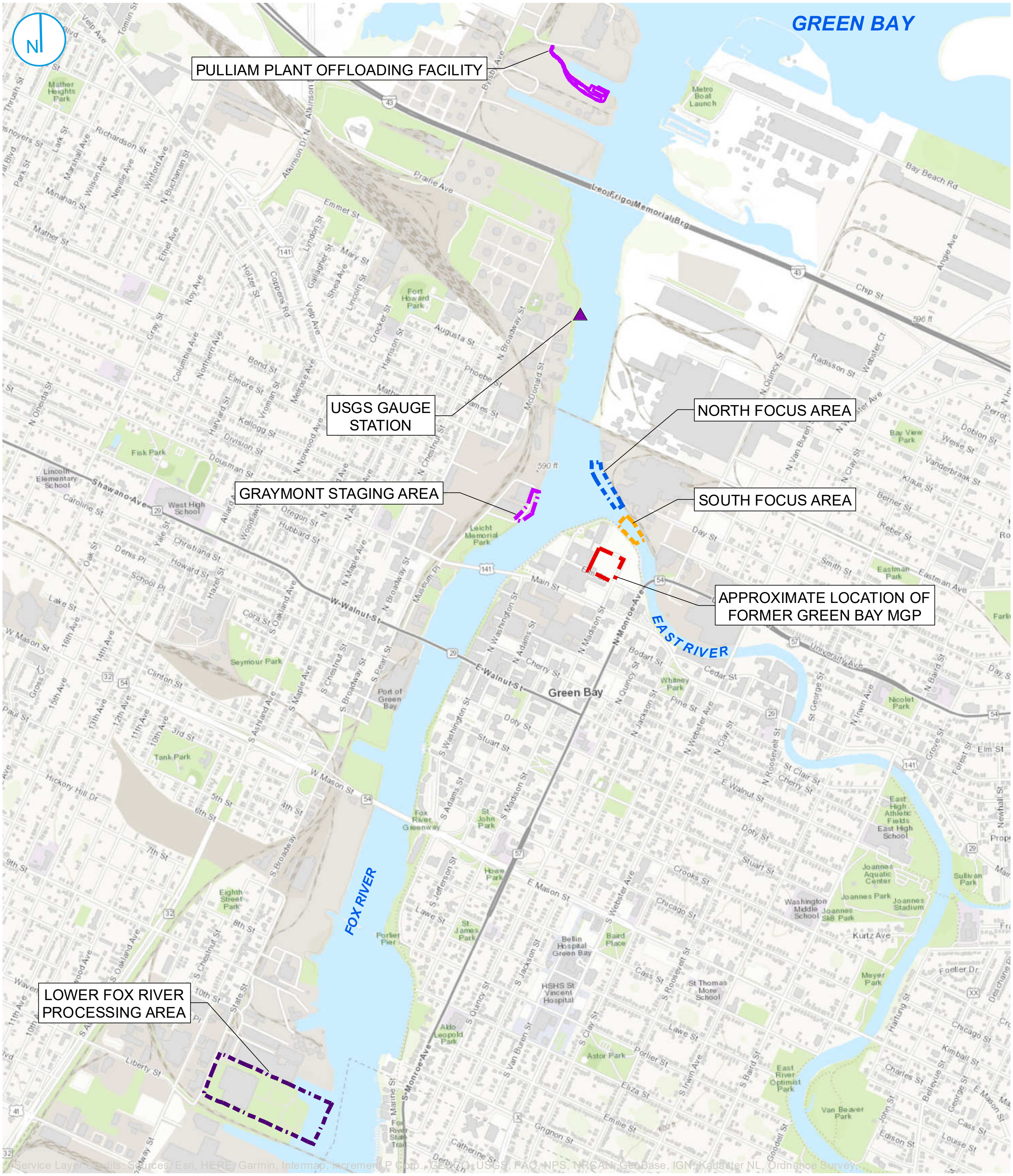
Medium, Exposure Area, and Basis of Exposure Point Concentration	Industrial		Construction Worker		Residential		Table Cross References
	Constituents of Potential Concern (COPC)[a]		Constituents of Potential Concern (COPC)[a]		Constituents of Potential Concern (COPC)[a]		
	Cancer Risk	Noncancer Risk	Cancer Risk	Noncancer Risk	Cancer Risk	Noncancer Risk	
Soil boring samples (All depths) - Direct contact, incidental ingestion, and dust inhalation routes of potential exposure							
Site wide	Arsenic, benzene, **cPAHs**, ethylbenzene, **NAPL**		Ethylbenzene, **cPAHs**, **NAPL**		**Arsenic**, benzene, **cPAHs**, **ethylbenzene**, **2-methylnaphthalene**, **cyanide**, **mercury**, **xylenes**, **NAPL**		See Appendix 3 - Tables 1a-c
Maximum	**2E-04**	**3E+00**	7E-06	**3E+01**	**1E-03**	**2E+01**	
Average	7E-06	1E-01	2E-07	7E-01	7E-05	1E+00	
Treated soil samples (All piles considered passing for backfilling) - Direct contact, incidental ingestion, and dust inhalation routes of potential exposure							
Backfilled 2003 remediation excavations	Arsenic		No COPC identified		Arsenic, cPAHs		See Appendix 3 - Tables 2a-c
Maximum	2E-06	1E-02	3E-08	8E-02	2E-05	2E-01	
Average	8E-07	7E-03	2E-08	3E-02	6E-06	8E-02	

Notes: This table provides a summary of the constituents of potential concern (COPCs) for soil by exposure scenario (i.e., residential, industrial worker, and construction worker) and the cumulative cancer and noncancer risk estimates associated with the COPCs in soil. Cancer risk estimates are shaded in green, while noncancer risk estimates are shaded in rose. All cumulative risk estimates are reported to one significant digit following U.S. Environmental Protection Agency (EPA) risk assessment guidance. Those COPCs considered constituents of concern (COCs) are also summarized in this table (see explanation below). COPCs are chemicals that have a *maximum concentration* in an environmental medium (e.g., soil) that exceeds a target cancer risk of 1×10^{-6} or a target noncancer risk (defined by a hazard quotient [HQ]) of 1.0. Once classified as a COPC, each COPC is evaluated further in the preliminary risk assessment to determine whether it poses an unacceptable risk based on site-specific conditions. The risk estimates for COPC are calculated using the site data to determine whether a COPC is classified as a constituents of concern (COC). When risks are above one or more of the upper risk management criteria (i.e., cancer risk is $>1x10^{-4}$ or its noncancer risk is >1) then in this preliminary risk evaluation we call out specific chemicals as COC. Any COPC that has a risk above one of these upper risk criteria for the given scenario is defined as a COC. An individual chemical, however, may be considered a COC even if its cancer risk is $<1x10^{-4}$ or its noncancer risk is <1 if it contributes substantially to a cumulative risk estimate that is above a regulatory risk criterion.

Footnotes:

[a] **Bold COPC are COC based on the results of the preliminary risk evaluation. Manufactured gas plant (MGP) residuals (NAPL) where present in a medium are shown because they present a**

FIGURES



Y:\GIS\Projects\15\1584\MXD\RI_2020\Figure 1 _Site Location Map.mxd

PROJECT: 73251 | DATED: 8/3/2020 | DESIGNER: galarnmc

KEY MAP

Map Scale: 1:24,000;
Map Center: 88°0'52"W 44°31'3"N

0 1,000 2,000 Feet

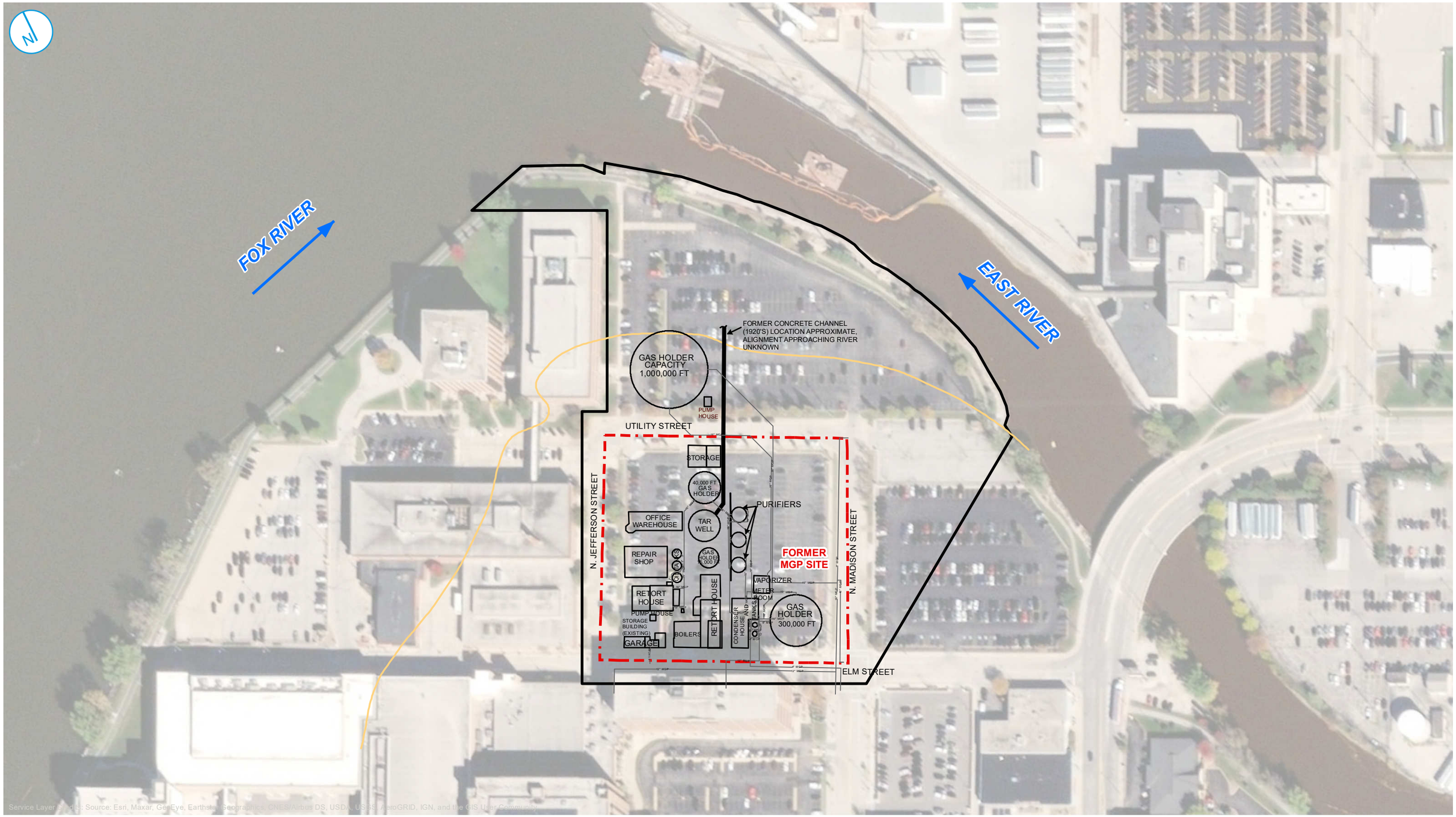
SITE LOCATION MAP

FIGURE 1

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



UPLAND SITE BOUNDARY
FORMER MGP SITE
BUILDING FOOTPRINT
APPROXIMATE SHORELINE (1835)

0 75 150 Feet

FORMER MGP STRUCTURES

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

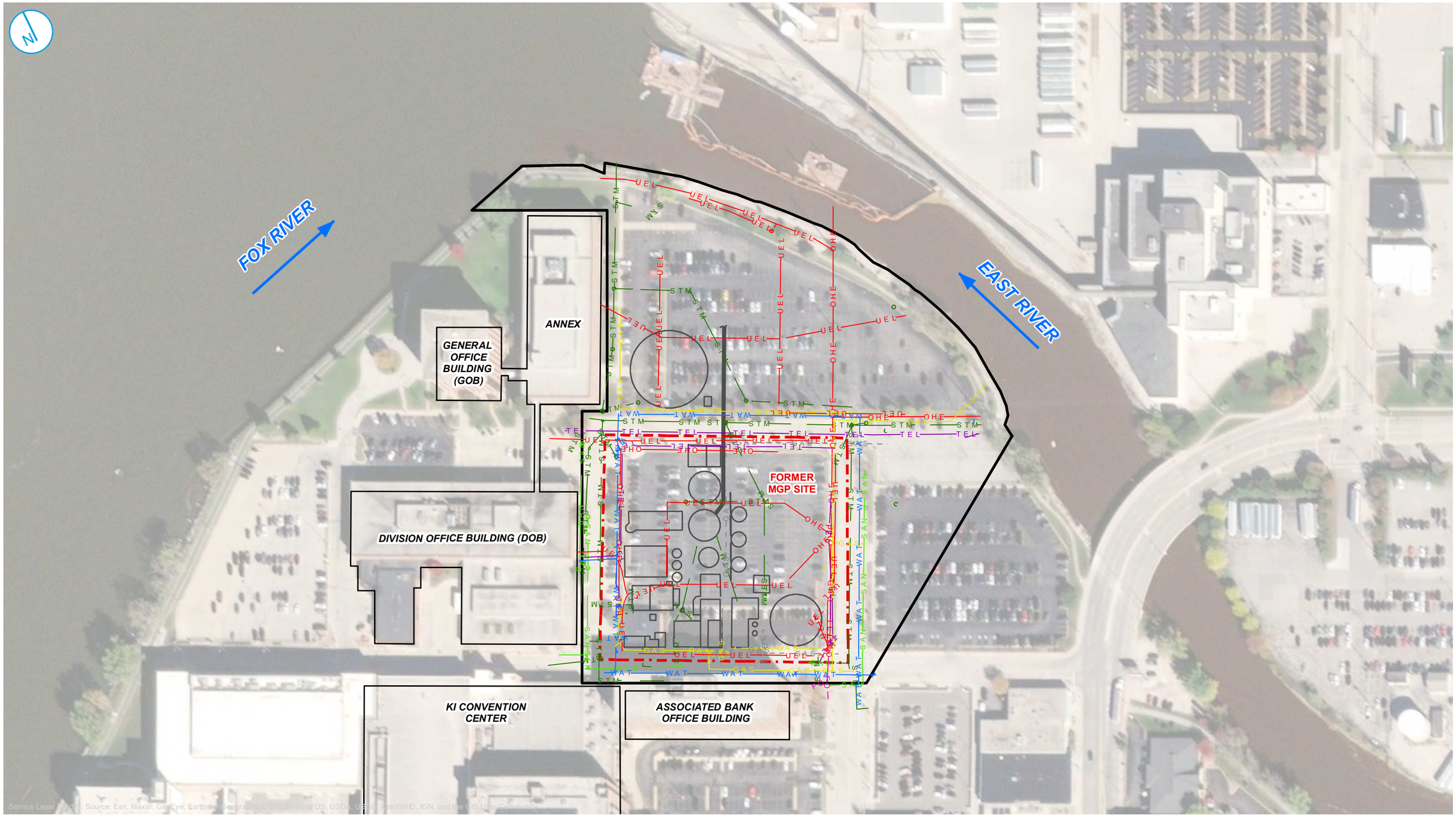
FIGURE 2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

Y:\GIS\Projects\15\15584\MXD\RI_2020\Figure 3_Utility Lines.mxd

PROJECT: 169000XXXX | DATED: 9/14/2020 | DESIGNER: galarnmc



UPLAND SITE BOUNDARY
FORMER MGP SITE
BUILDING FOOTPRINT

FO — FIBER OPTIC LINE
GAS — GAS LINE
SAN — SANITARY SEWER LINE
STM — STORM SEWER LINE
TEL — TELEPHONE LINE
WAT — WATER LINE
UEL — UNDERGROUND ELECTRIC LINE
OHE — OVERHEAD ELECTRIC LINE
GAS – – ABANDONED GAS LINE

0 75 150 Feet

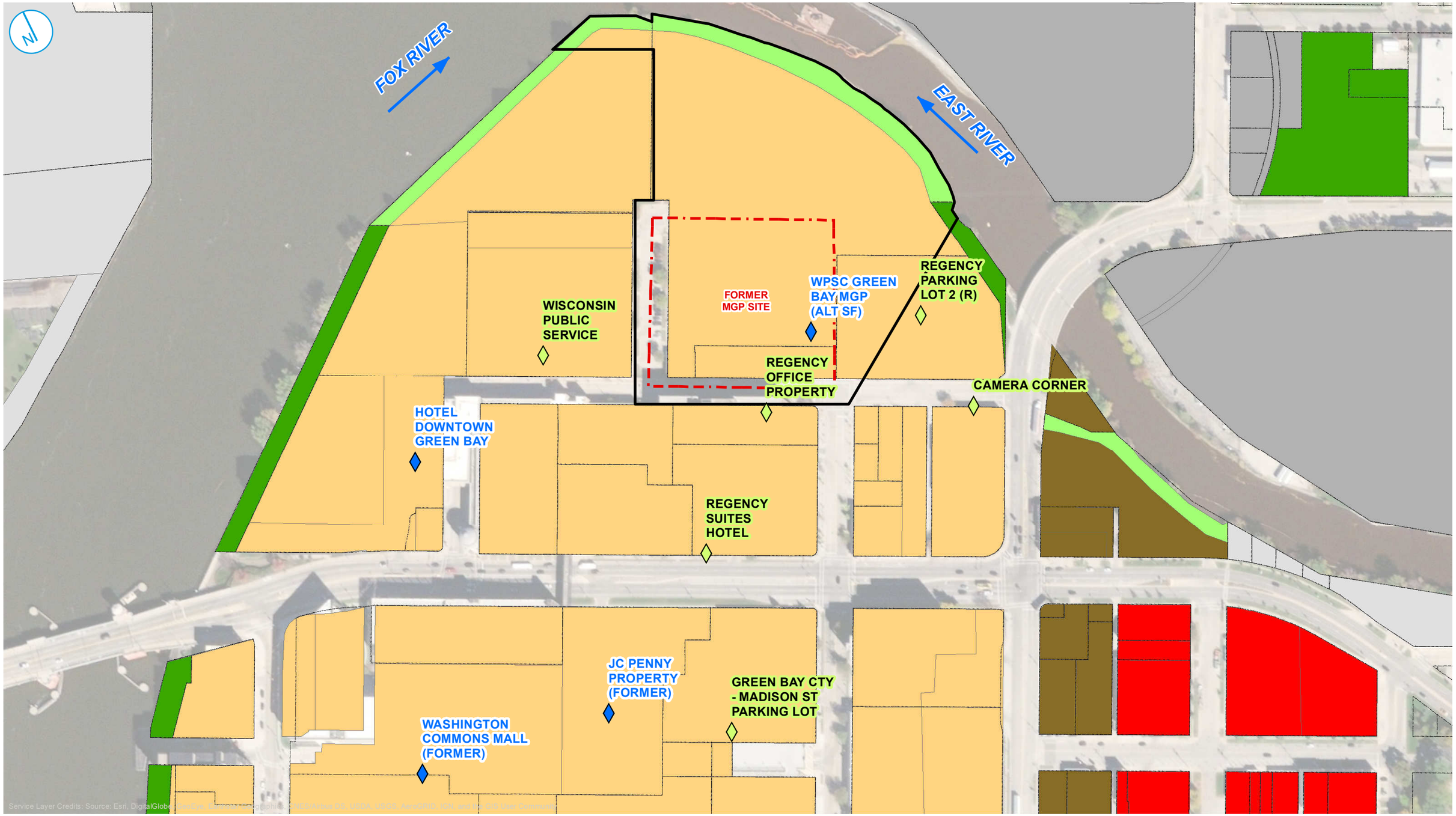
UTILITY LINES

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 3

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



UPLAND SITE BOUNDARY
FORMER MGP SITE
OPEN BRRTS SITE - ONGOING CLEANUP
CLOSED BRRTS SITE - CLEANUP COMPLETE

0 100 200 Feet

COMMERCIAL
CONSERVANCY
DOWNTOWN 1
DOWNTOWN 2
GENERAL INDUSTRY
LIGHT INDUSTRY
PUBLIC PROPERTY / INSTITUTIONAL

Notes
BRRTS IS THE WDNR BUREAU OF REMEDIATION AND REDEVELOPMENT TRACKING SYSTEM FOR ENVIRONMENTALLY IMPARED PROPERTIES

ZONING DATA: CITY OF GREEN BAY INTERACTIVE PARCEL MAP
(https://greenbaywi.gov/180/GIS-Mapping)

ZONING LAYOUT AND POTENTIAL NON-MGP SOURCES

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 4

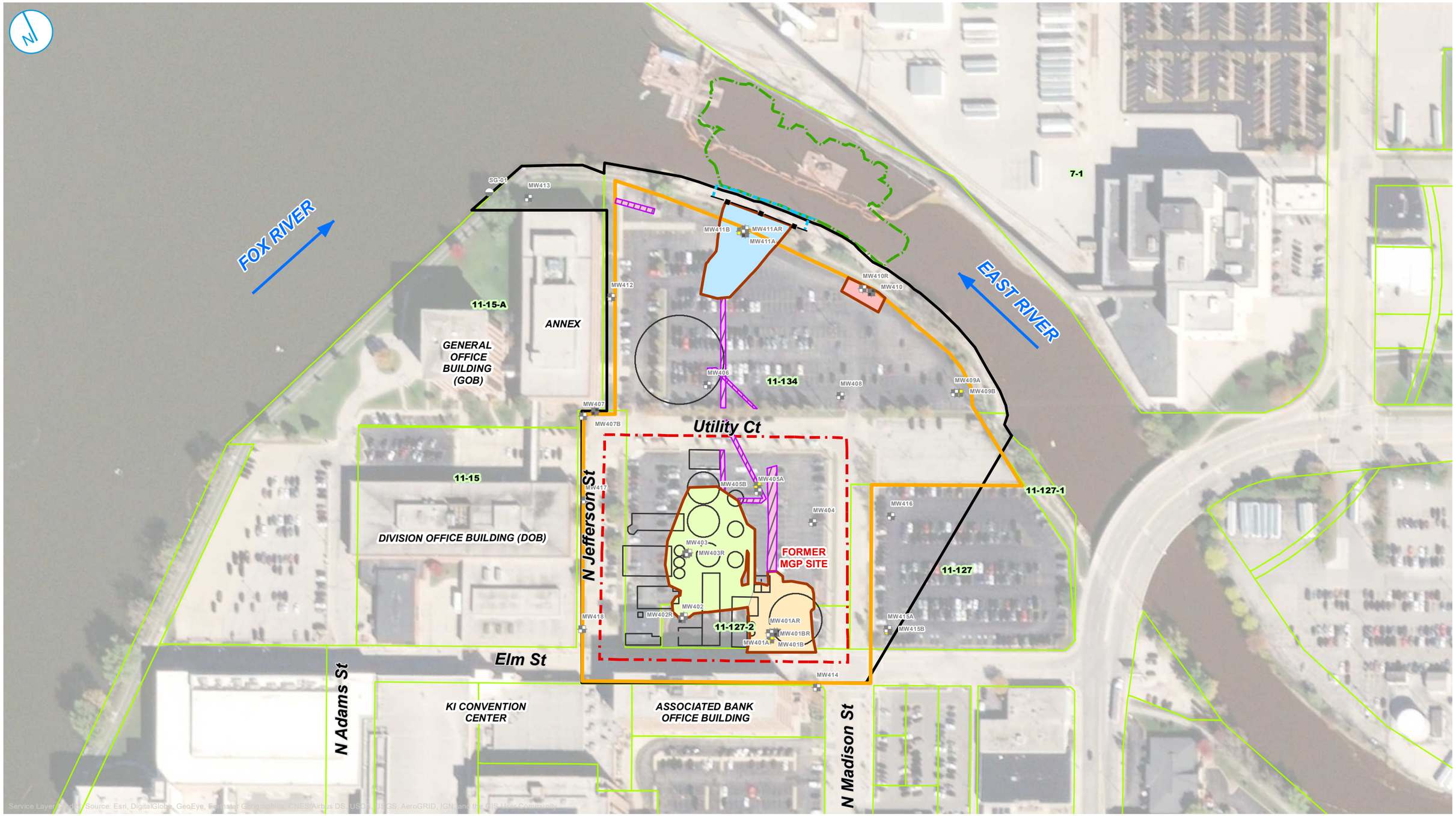
RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

PROJECT: 1690000XXXX | DATED: 8/3/2020 | DESIGNER: galarnmc
Y:\GIS\Projects\15\15841\MXD\RI_2020\Figure 4_Zoning Layout.mxd

Y:\GIS\Projects\15\1584\MXD\RI_2020\Figure 5_Soil Remediation Excavation.mxd

PROJECT: 169000XXXX | DATED: 8/3/2020 | DESIGNER: galarnmc



- UPLAND SITE BOUNDARY
- FORMER MGP SITE
- SHEET PILE WALL
- SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)

0 75 150 Feet

- TAX PARCEL
- CAP MAINTENANCE AREA
- SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
- FORMER STRUCTURE
- SOIL REMEDIATION EXCAVATION AREAS (2003)
- SOIL REMEDIATION MGP PIPING RUNS (2003)

- EXCAVATION AREA 1 (6-8 FT)
- EXCAVATION AREA 2 (8-14 FT) *TAR WELL (12-22 FT)
- EXCAVATION AREA 3 (8-12 FT)
- EXCAVATION AREA 4 (7 FT)
- EXCAVATED PIPING RUN

- STAFF GAUGE
- MONITORING WELL
- ABANDONED MONITORING WELL/PIEZOMETER
- PIEZOMETER

SOIL REMEDIATION EXCAVATION AREAS & EXTENT OF CAP

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

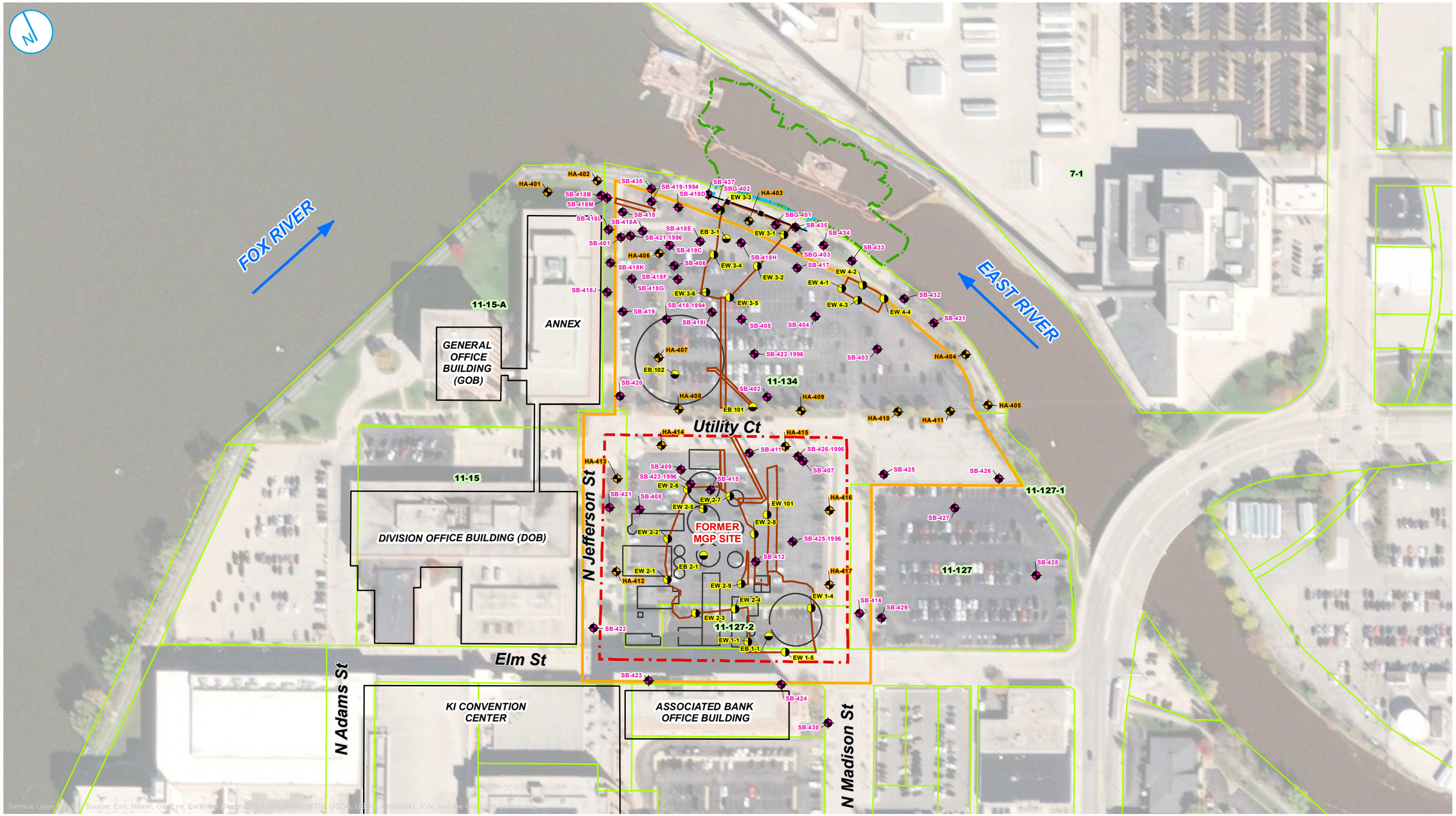
FIGURE 5

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

Y:\GIS\Projects\15\15584\MXD\RI_2020\Figure 6_Post Remediation Soil Samples.mxd

PROJECT: 1690000XXXX | DATED: 9/14/2020 | DESIGNER: galammc



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL

FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)

EXCAVATION BASE SAMPLING LOCATION
EXCAVATION WALL SAMPLING LOCATION
HAND AUGER SAMPLING LOCATION
SOIL BORING LOCATION

0 75 150 Feet

POST REMEDIATION SOIL SAMPLE LOCATION MAP

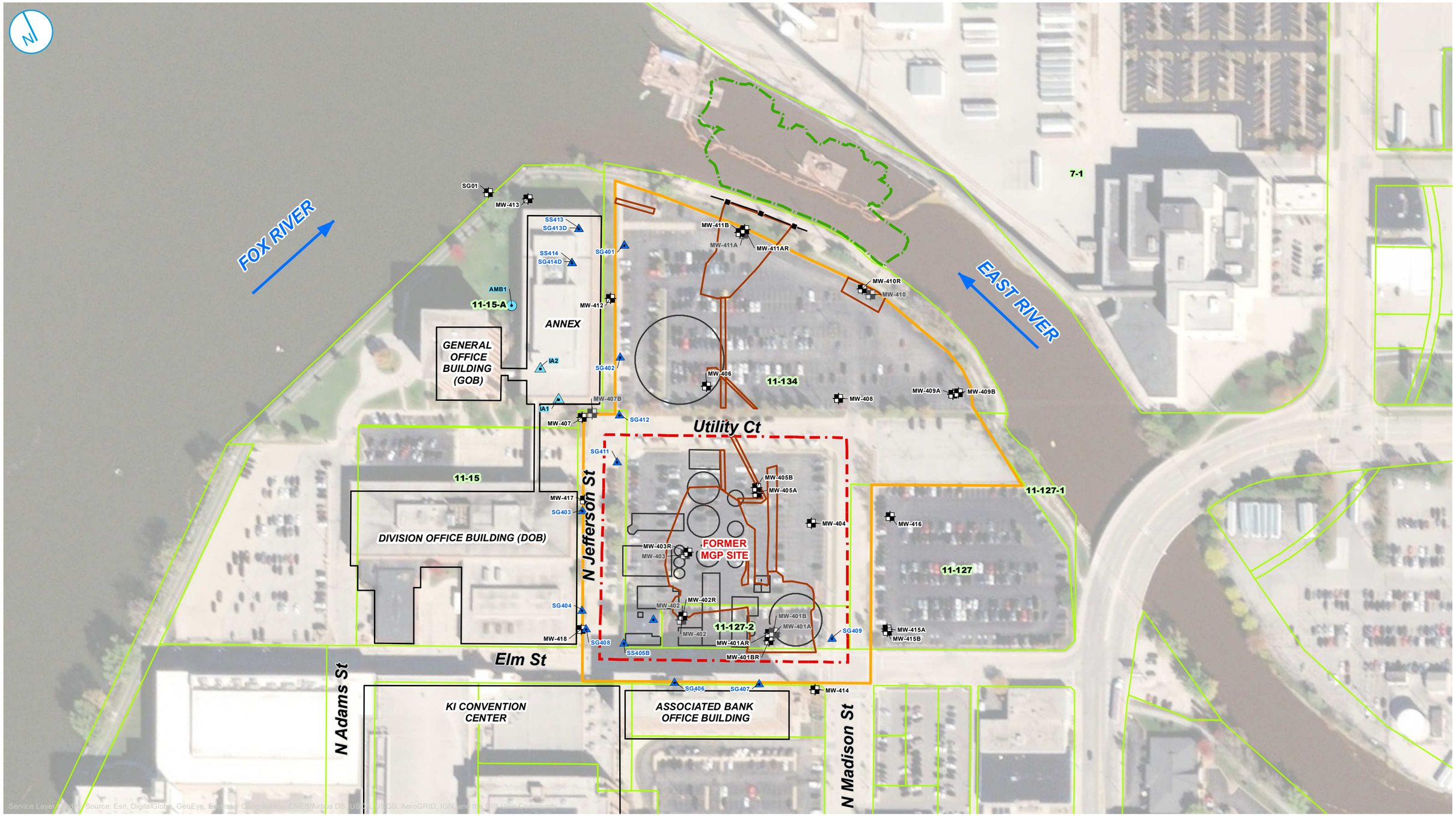
UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 6

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Y:\GIS Projects\151\1584\MXD\RI_2020\Figure 7_GW and VI Monitoring Locations.mxd

PROJECT: 169000XXXX | DATED: 9/3/2020 | DESIGNER: galarnmc



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)

0 75 150 Feet

AMBIENT AIR SAMPLING LOCATION
INDOOR AIR SAMPLING LOCATION
MONITORING WELL LOCATION
SOIL GAS SAMPLING LOCATION
ABANDONDED MONITORING WELL LOCATION

GROUNDWATER AND VAPOR INTRUSION MONITORING LOCATIONS

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

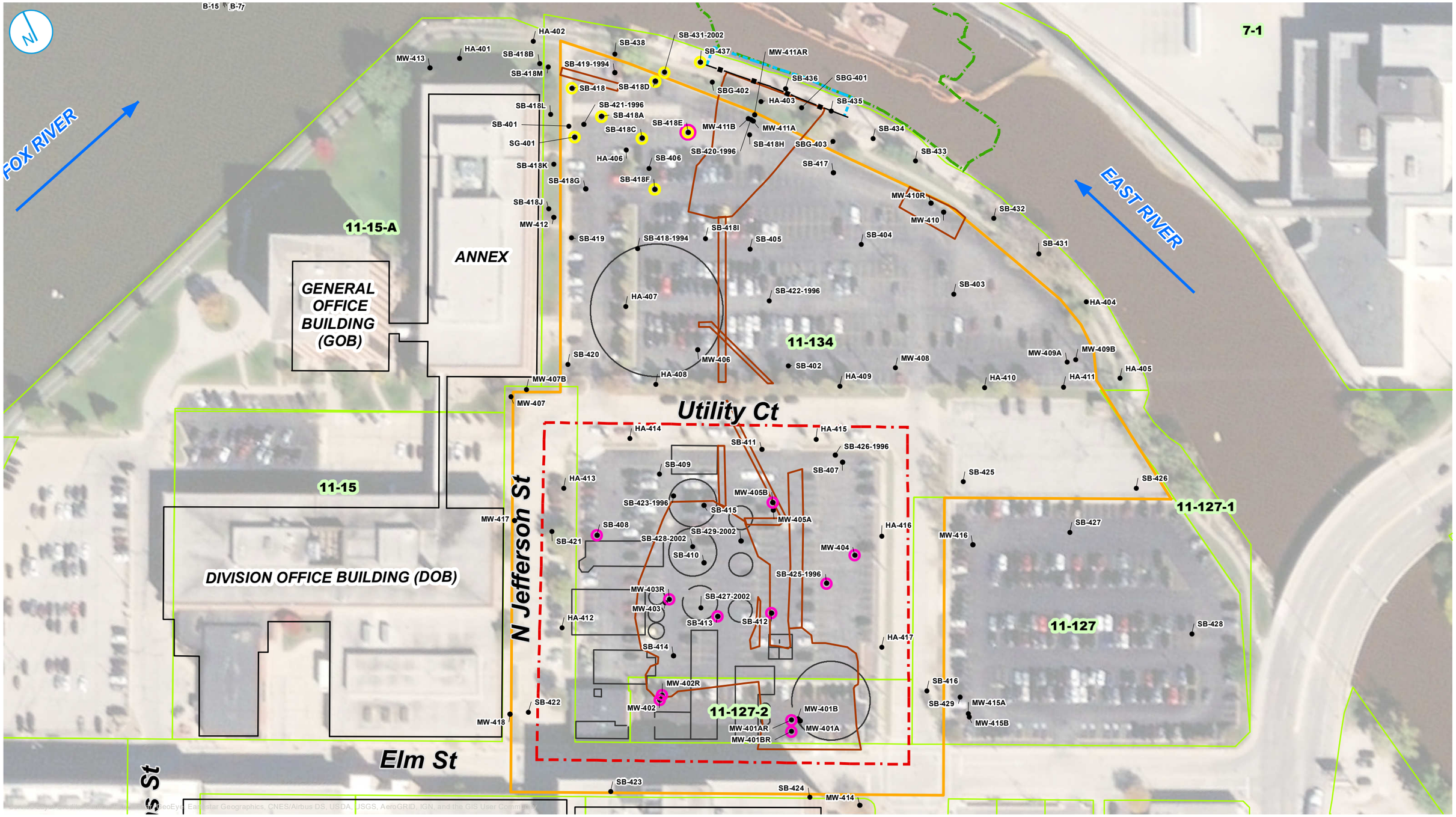
FIGURE 7

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

Y:\GIS\Projects\15\15841MXD\RI_2020\Figure 8_Post Remediation MGP Residual Observations.mxd

PROJECT: 169000XXXX | DATED: 9/15/2020 | DESIGNER: galarnmc



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL

FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)

0 50 100 Feet

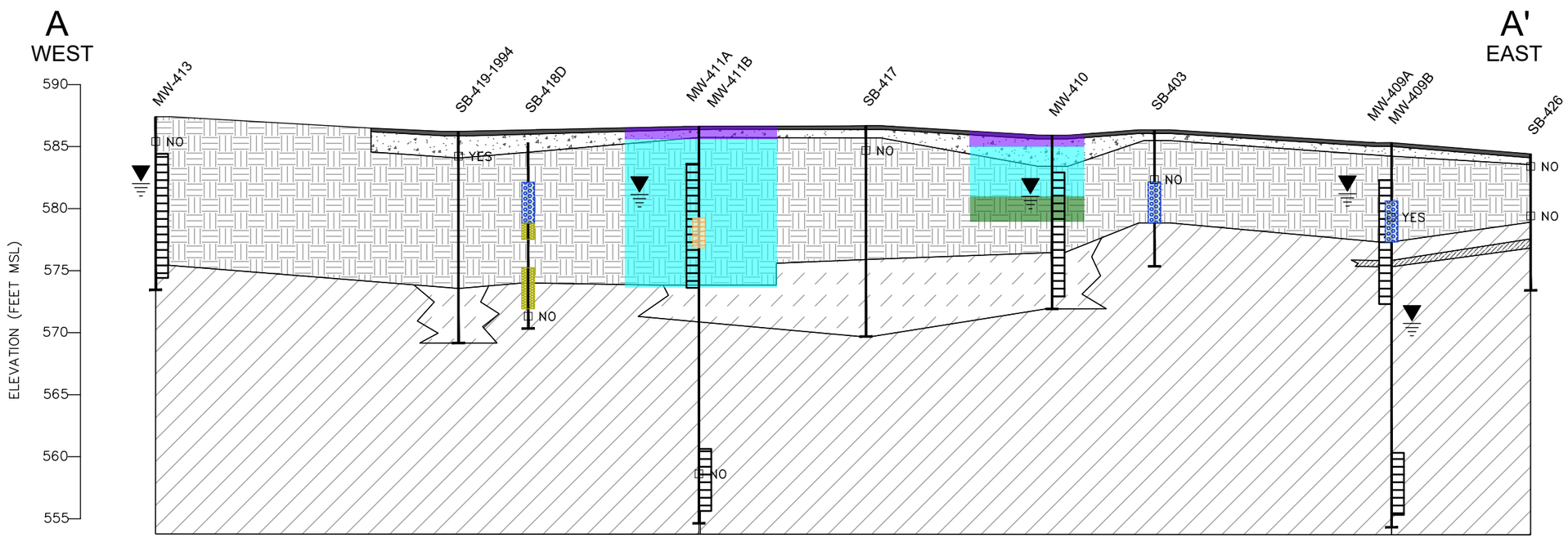
OIL WETTED-COATED MATERIAL ABOVE AND WITHIN NATIVE CLAY
OIL WETTED-COATED MATERIAL ABOVE NATIVE CLAY
OIL WETTED-COATED MATERIAL WITHIN FRACTURES OF NATIVE CLAY
SOIL BORING

POST REMEDIATION MGP RESIDUAL OBSERVATIONS

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 8

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



VERTICAL SCALE IN FEET: 10 / 80 HORIZONTAL SCALE IN FEET

VERTICAL EXAGGERATION = 8

LEGEND

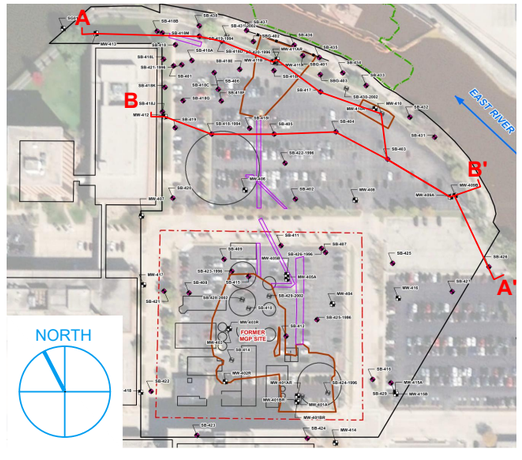
- ASPHALT
- SANDS/GRAVEL (ASPHALT BASE COURSE)
- FILL
- SAND
- SILT
- CLAY
- FISSURED CLAY
- SCREENED INTERVAL
- WATER LEVEL ELEVATION (8/26/2002)
- SOIL SAMPLE EXCEEDS CUMULATIVE CR>10-5 OR HI>1 RESIDENTIAL (YES/NO)

LEGEND (BACKFILL MATERIALS)

- THERMALLY TREATED FILL
- BASE COURSE/ASPHALT CAP
- GRAVEL WITH GEOTEXTILE (ONLY IN EXC 4)

LEGEND (NAPL IMPACTS)

- SHEEN
- STAINING
- OIL COATED/OIL WETTED



NOTES

1. CROSS SECTION REPRESENTS A GENERALIZED INTERPRETATION OF SUBSURFACE CONDITIONS. STRATUM LINES ARE BASED ON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACUTAL SUBSURFACE CONDITIONS. FOR DETAILED DESCRIPTION OF INDIVIDUAL BORINGS, REFER TO SOIL BORING LOGS.
2. FORMER STURCTURES SHOWN WHERE BASE WAS FIELD CONFIRMED BY INVESTIGATION.

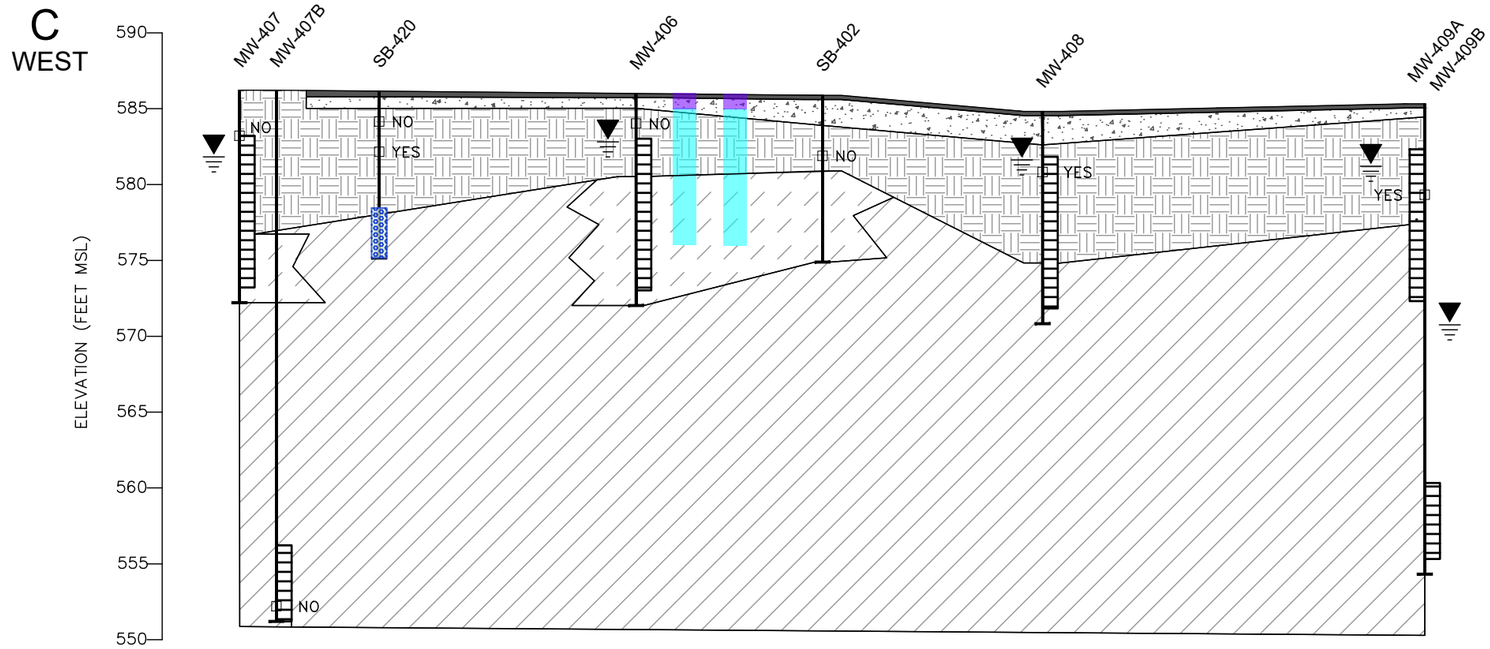
GEOLOGIC CROSS SECTIONS A-A' AND B-B'

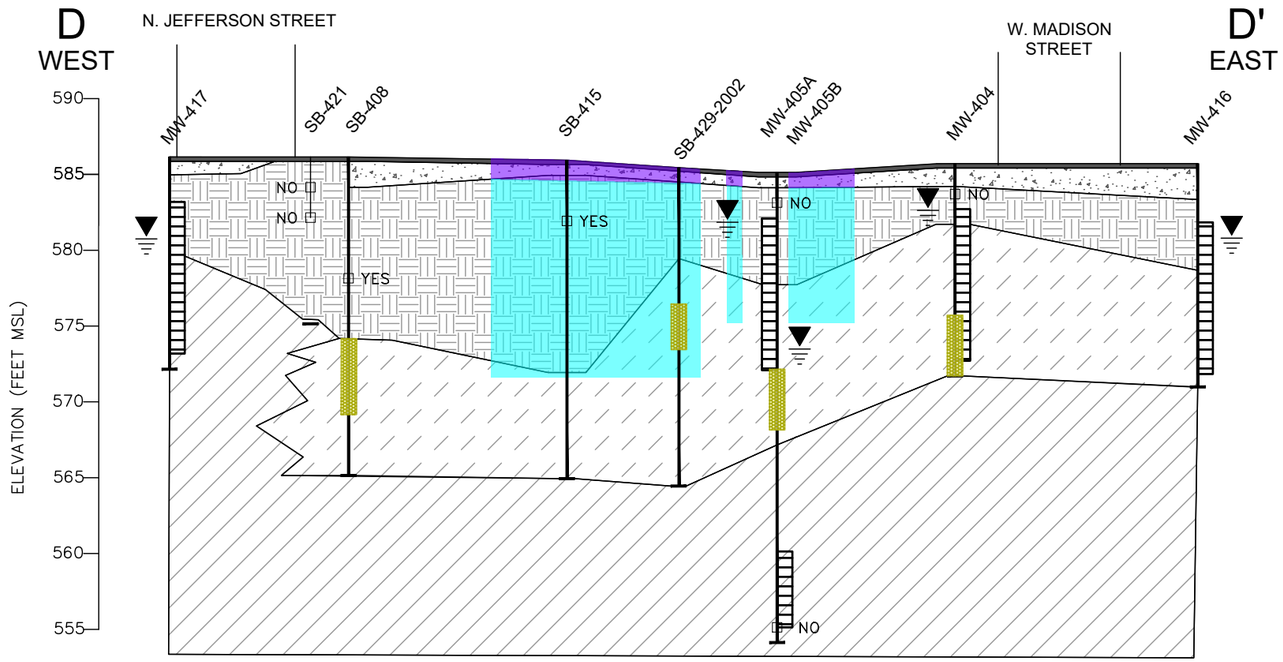
UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT SITE
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

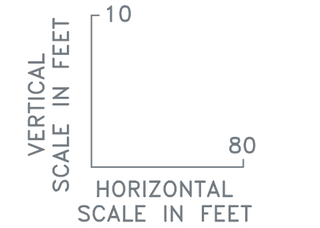
FIGURE 9A

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL







VERTICAL EXAGGERATION = 8

LEGEND

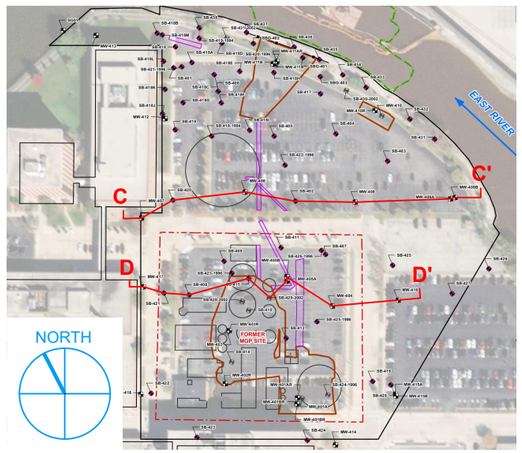
- ASPHALT
- SANDS/GRAVEL (ASPHALT BASE COURSE)
- FILL
- SAND
- SILT
- CLAY
- FISSURED CLAY
- SCREENED INTERVAL
- WATER LEVEL ELEVATION (8/26/2002)
- SOIL SAMPLE EXCEEDS CUMULATIVE CR>10-5 OR HI>1 RESIDENTIAL (YES/NO)

LEGEND (BACKFILL MATERIALS)

- THERMALLY TREATED FILL
- BASE COURSE/ASPHALT CAP

LEGEND (NAPL IMPACTS)

- STAINING
- OIL COATED/OIL WETTED



NOTES

1. CROSS SECTION REPRESENTS A GENERALIZED INTERPRETATION OF SUBSURFACE CONDITIONS. STRATUM LINES ARE BASED ON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACUTAL SUBSURFACE CONDITIONS. FOR DETAILED DESCRIPTION OF INDIVIDUAL BORINGS, REFER TO SOIL BORING LOGS.
2. FORMER STURCTURES SHOWN WHERE BASE WAS FIELD CONFIRMED BY INVESTIGATION.

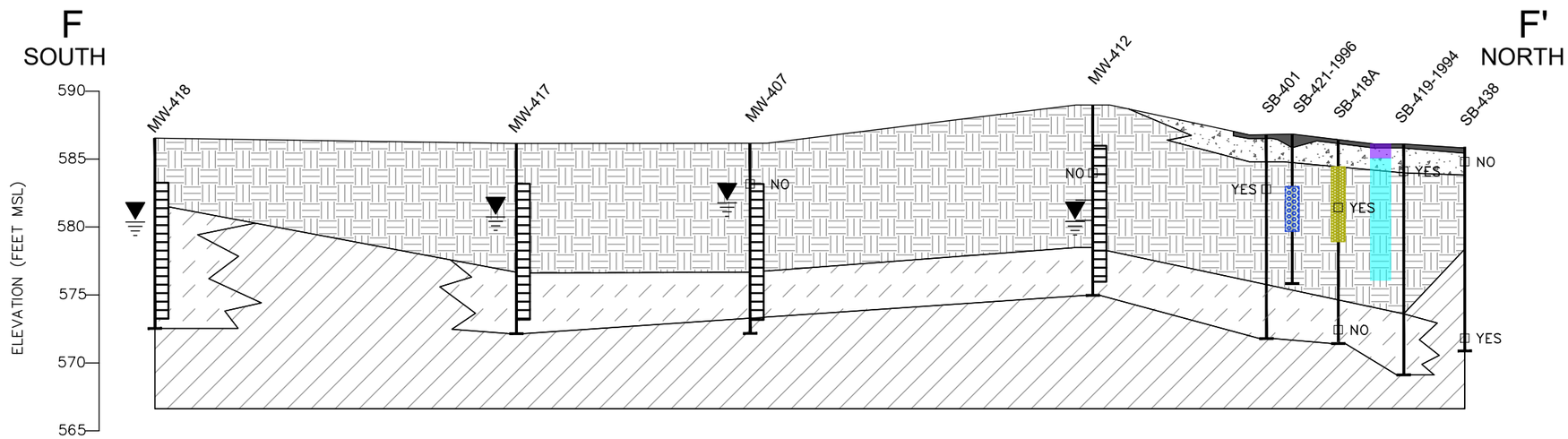
GEOLOGIC CROSS SECTIONS C-C' AND D-D'

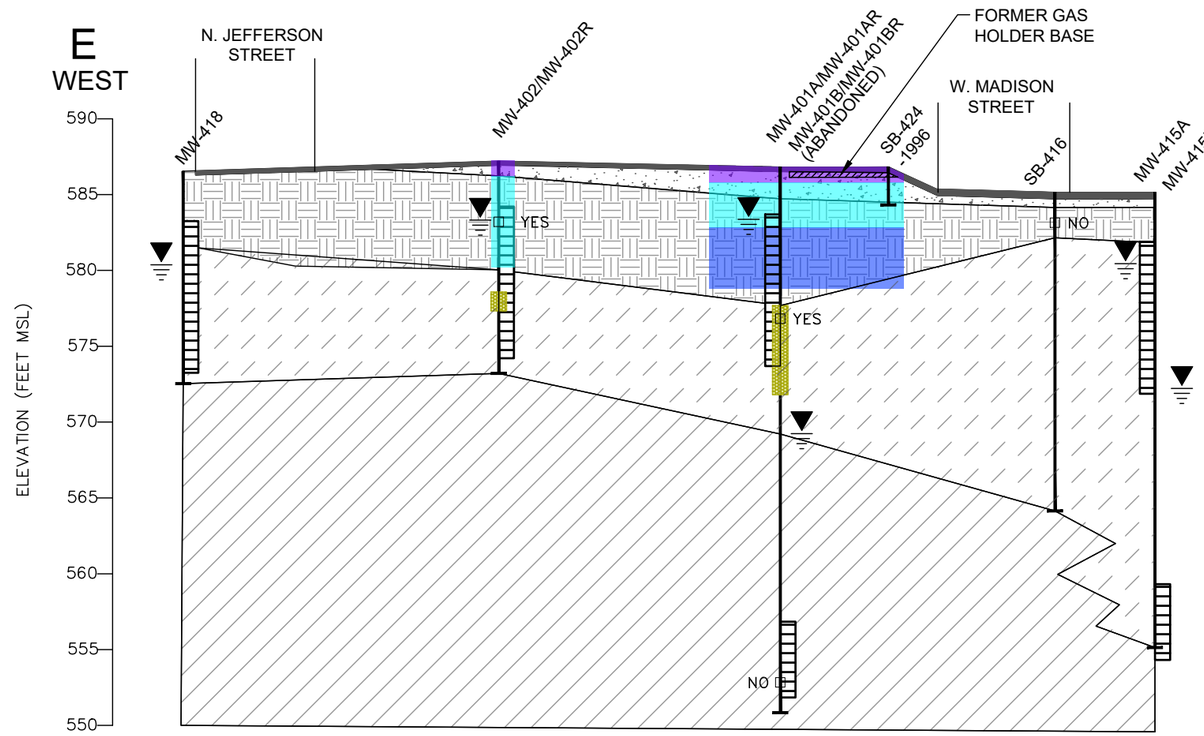
UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT SITE
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

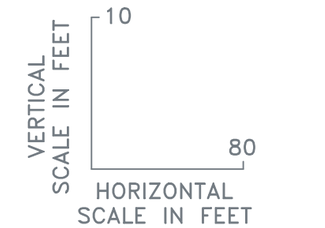
FIGURE 9B

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL







VERTICAL EXAGGERATION = 8

LEGEND

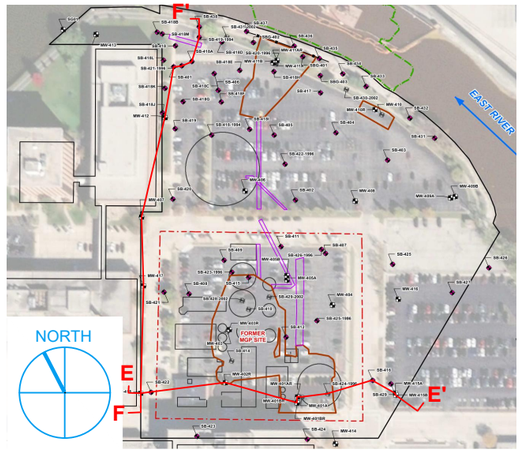
- ASPHALT
- SANDS/GRAVEL (ASPHALT BASE COURSE)
- FILL
- SAND
- CLAY
- FISSURED CLAY
- SCREENED INTERVAL
- WATER LEVEL ELEVATION (8/26/2002)
- SOIL SAMPLE EXCEEDS CUMULATIVE CR>10-5 OR HI>1 RESIDENTIAL (YES/NO)

LEGEND (BACKFILL MATERIALS)

- THERMALLY TREATED FILL
- BASE COURSE/ASPHALT CAP
- IMPORTED SAND (EXC 1)

LEGEND (NAPL IMPACTS)

- STAINING
- OIL COATED/OIL WETTED



NOTES

1. CROSS SECTION REPRESENTS A GENERALIZED INTERPRETATION OF SUBSURFACE CONDITIONS. STRATUM LINES ARE BASED ON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACUTAL SUBSURFACE CONDITIONS. FOR DETAILED DESCRIPTION OF INDIVIDUAL BORINGS, REFER TO SOIL BORING LOGS.
2. FORMER STURCTURES SHOWN WHERE BASE WAS FIELD CONFIRMED BY INVESTIGATION.

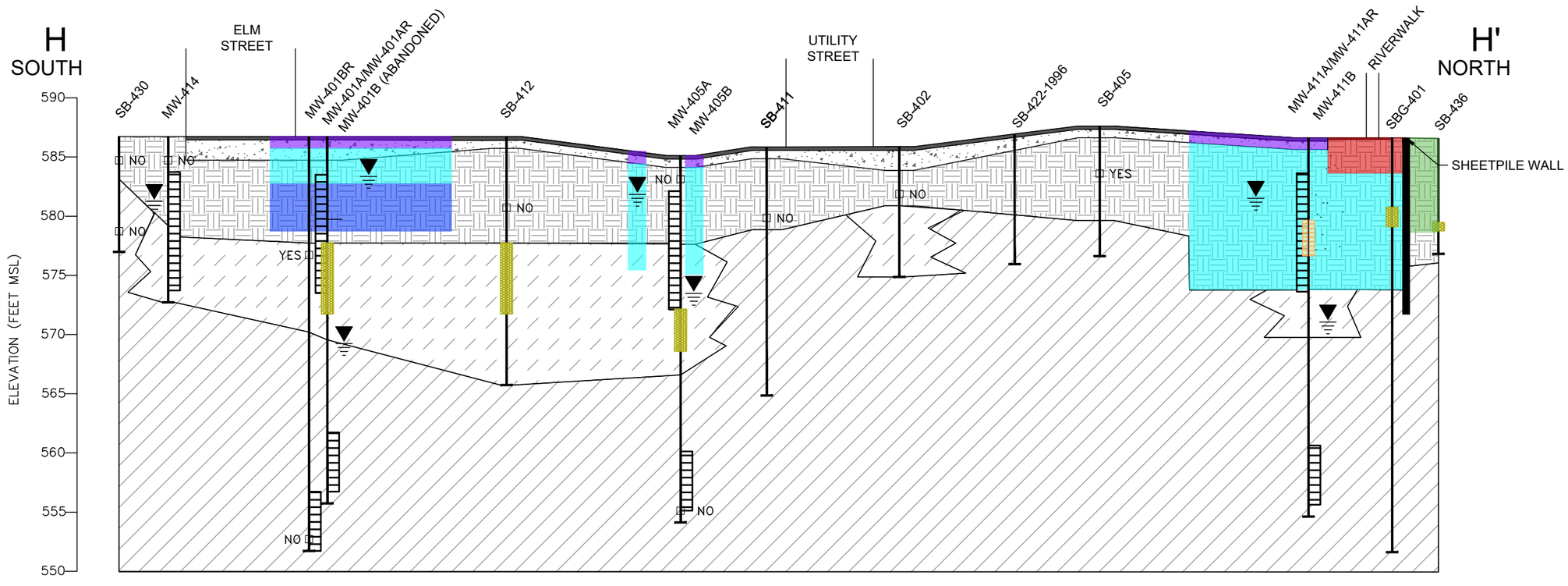
GEOLOGIC CROSS SECTIONS E-E' AND F-F'

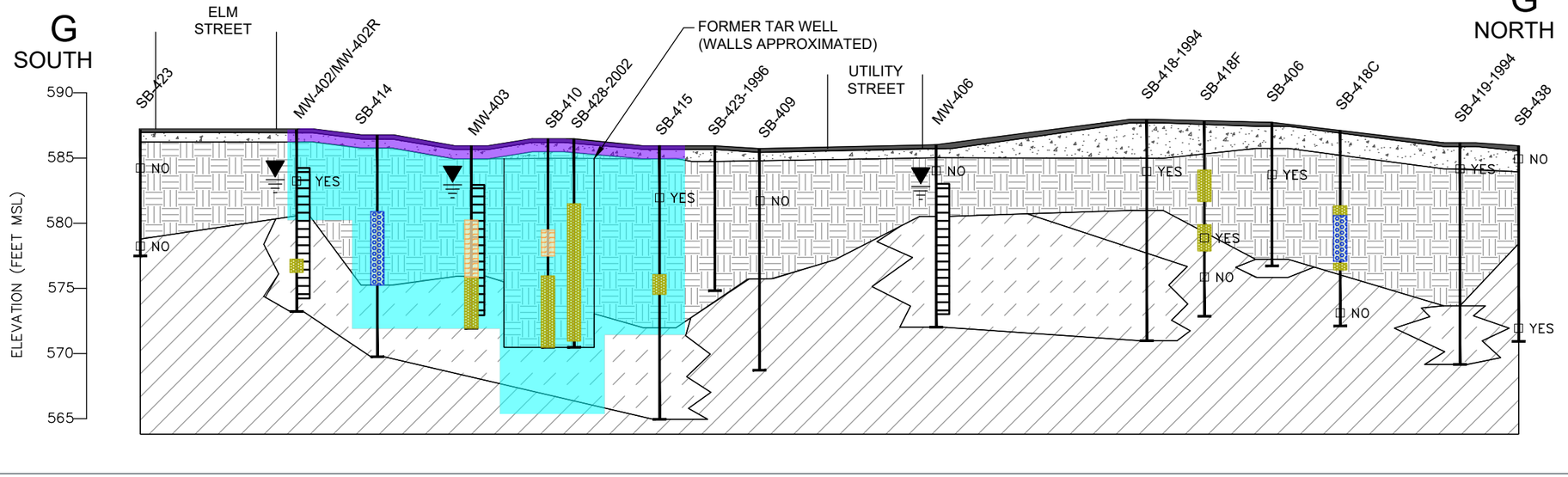
UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT SITE
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 9C

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL





VERTICAL SCALE IN FEET: 10 = 80 HORIZONTAL SCALE IN FEET

VERTICAL EXAGGERATION = 8

LEGEND

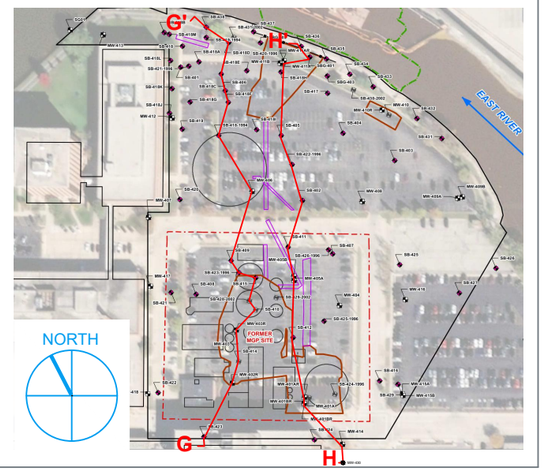
- ASPHALT
- SANDS/GRAVEL (ASPHALT BASE COURSE)
- FILL
- SAND
- SILT
- CLAY
- FISSURED CLAY
- SCREENED INTERVAL
- WATER LEVEL ELEVATION (8/26/2002)
- SOIL SAMPLE EXCEEDS CUMULATIVE CR>10-5 OR HI>1 RESIDENTIAL (YES/NO)

LEGEND (BACKFILL MATERIALS)

- THERMALLY TREATED FILL
- BASE COURSE/ASPHALT CAP
- IMPORTED SAND (EXC1)
- TOPSOIL (ONLY IN PARTS OF EXC3)
- CLEAN GRAVEL (SHORELINE EXCAVATION AREA)

LEGEND (NAPL IMPACTS)

- SHEEN
- STAINING
- OIL COATED / OIL WETTED



NOTES

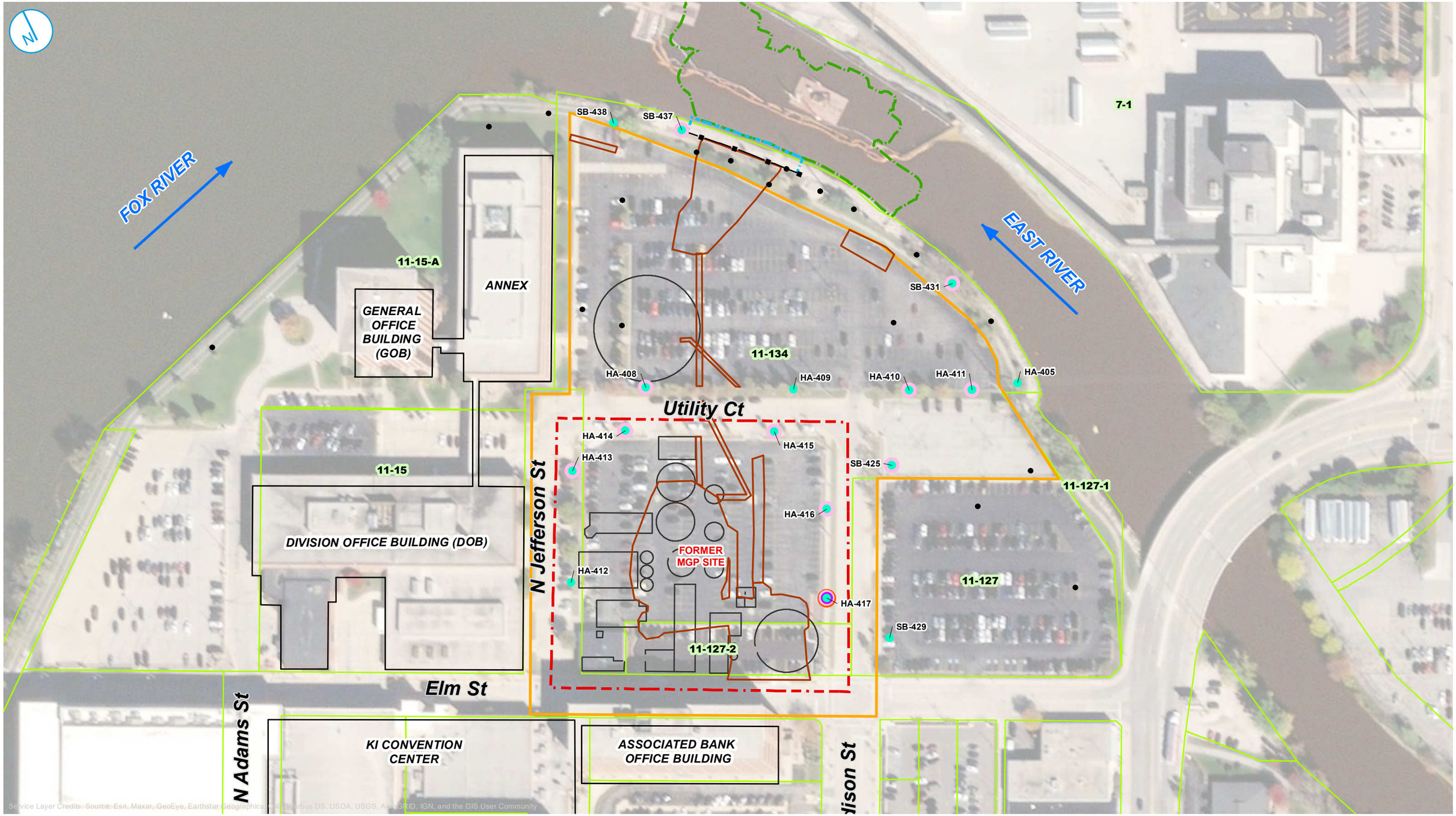
1. CROSS SECTION REPRESENTS A GENERALIZED INTERPRETATION OF SUBSURFACE CONDITIONS. STRATUM LINES ARE BASED ON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACUTAL SUBSURFACE CONDITIONS. FOR DETAILED DESCRIPTION OF INDIVIDUAL BORINGS, REFER TO SOIL BORING LOGS.
2. FORMER STURCTURES SHOWN WHERE BASE WAS FIELD CONFIRMED BY INVESTIGATION.

GEOLOGIC CROSS SECTIONS G-G' AND H-H'

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT SITE
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 9D

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)

0 62.5 125 Feet

BENZO(A)PYRENE EXCEEDANCE
NAPHTHALENE EXCEEDANCE
BENZO(A) ANTHRACENE, BENZO(B)FLUORANTHENE, DIBENZ(A,H)ANTHRACENE, OR INDENO(1,2,3-CD)PYRENE EXCEEDANCE
OTHER PAH EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

POST-REMEDIATION SOIL PAH EXCEEDANCES OF RESIDENTIAL SCREENING LEVELS 0-0.5 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT FORMER GREEN BAY MANUFACTURED GAS PLANT

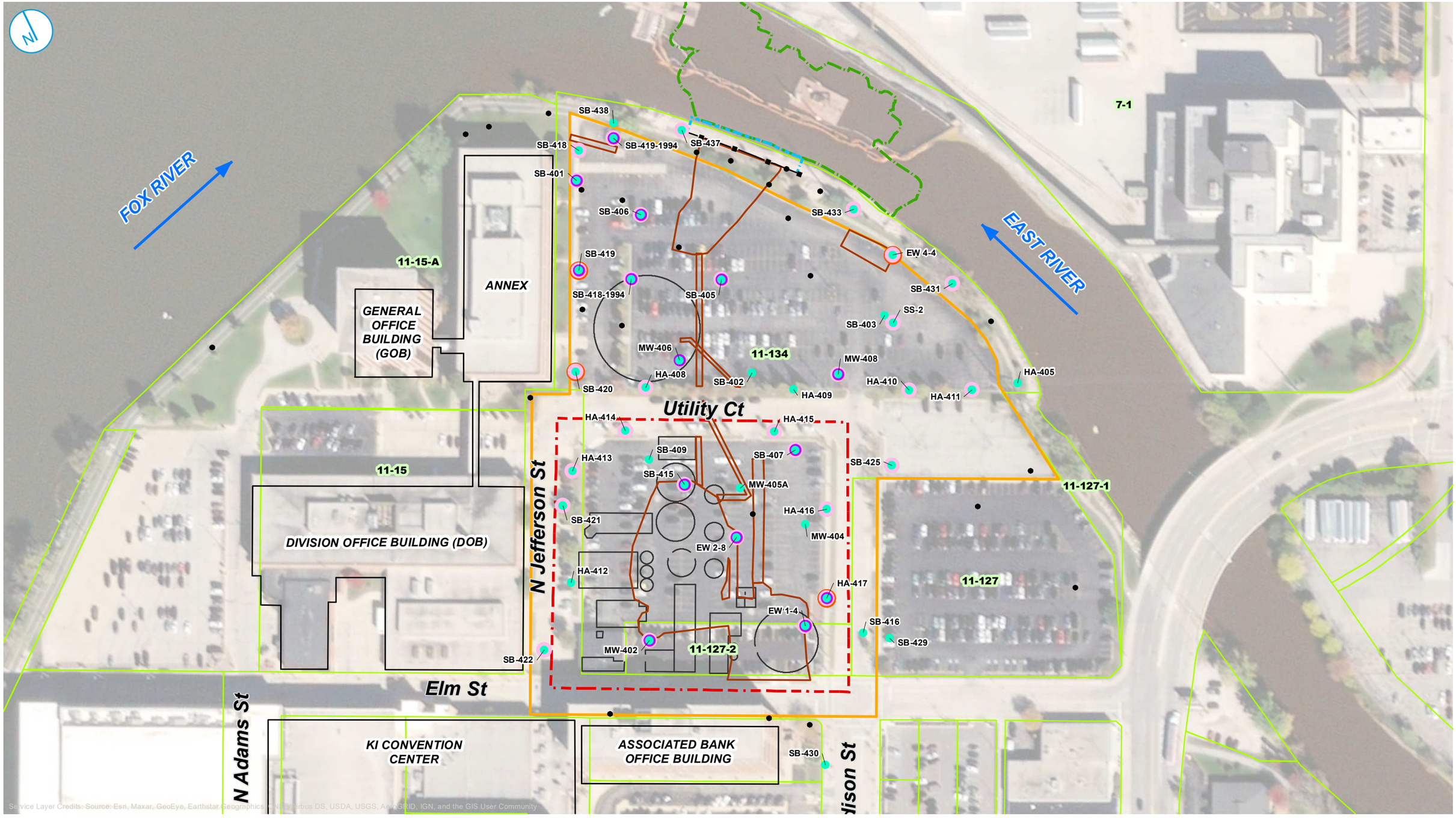
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 10a

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Y:\GIS\Projects\151584\MXD\RI_2020\Figure 10b_PAH Residential 0-4.mxd

PROJECT: 169000XXXX | DATED: 9/14/2020 | DESIGNER: galammc



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)

0 62.5 125 Feet

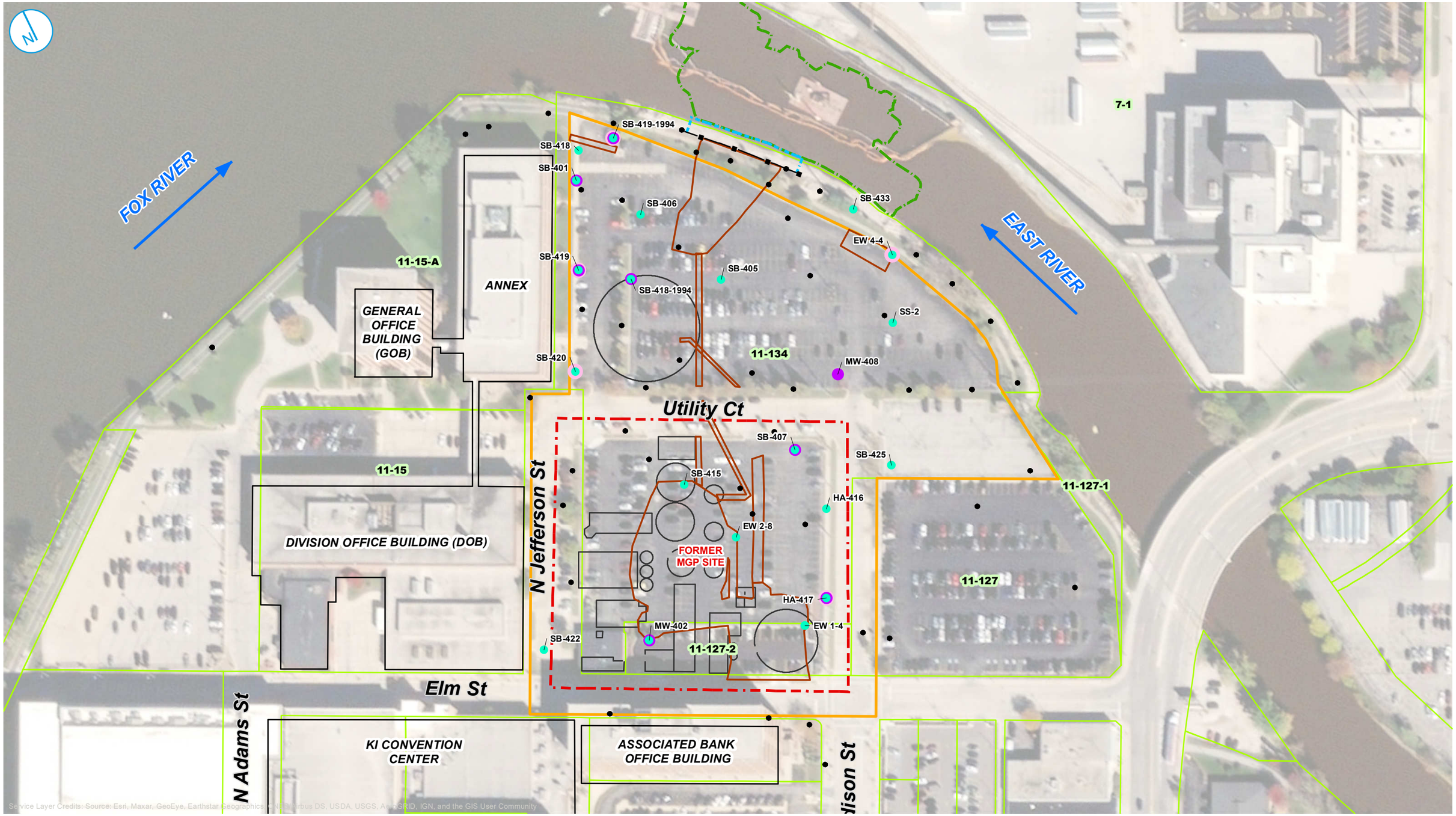
BENZO(A)PYRENE EXCEEDANCE
NAPHTHALENE EXCEEDANCE
BENZO(A) ANTHRACENE, BENZO(B)FLUORANTHENE, DIBENZ(A,H)ANTHRACENE, OR INDENO(1,2,3-CD)PYRENE EXCEEDANCE
OTHER PAH EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

POST-REMEDIATION SOIL PAH EXCEEDANCES OF RESIDENTIAL SCREENING LEVELS 0-4 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 10b

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
BENZO(A)PYRENE EXCEEDANCE
NAPHTHALENE EXCEEDANCE
BENZO(A) ANTHRACENE, BENZO(B)FLUORANTHENE, DIBENZ(A,H)ANTHRACENE, OR INDENO(1,2,3-CD)PYRENE EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

0 62.5 125 Feet

POST-REMEDIATION SOIL PAH EXCEEDANCES OF INDUSTRIAL SCREENING LEVELS 0-4 FEET BELOW GROUND SURFACE

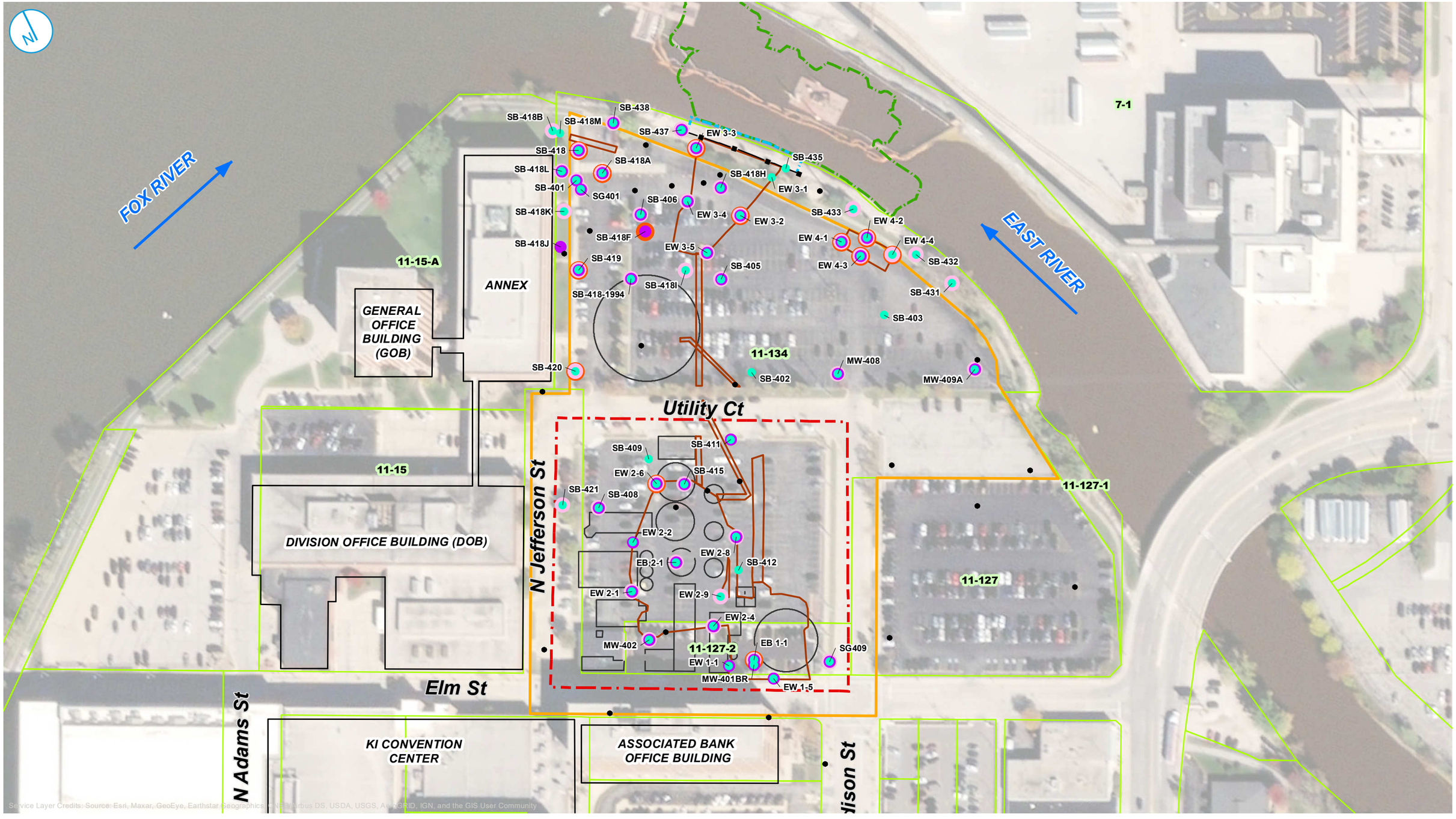
UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 10c

RAMBOLL US CORPORATION
A RAMBOLL COMPANY
RAMBOLL

Y:\GIS\Projects\15\15841MXD\RI_2020\Figure 10d_PAH Residential greater than 4.mxd

PROJECT: 169000XXXX | DATED: 9/14/2020 | DESIGNER: galammc



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)

0 62.5 125 Feet

BENZO(A)PYRENE EXCEEDANCE
NAPHTHALENE EXCEEDANCE
BENZO(A) ANTHRACENE, BENZO(B)FLUORANTHENE, DIBENZ(A,H)ANTHRACENE, OR INDENO(1,2,3-CD)PYRENE EXCEEDANCE
OTHER PAH EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

POST-REMEDIATION SOIL PAH EXCEEDANCES OF RESIDENTIAL SCREENING LEVELS GREATER THAN 4 FEET BELOW GROUND SURFACE

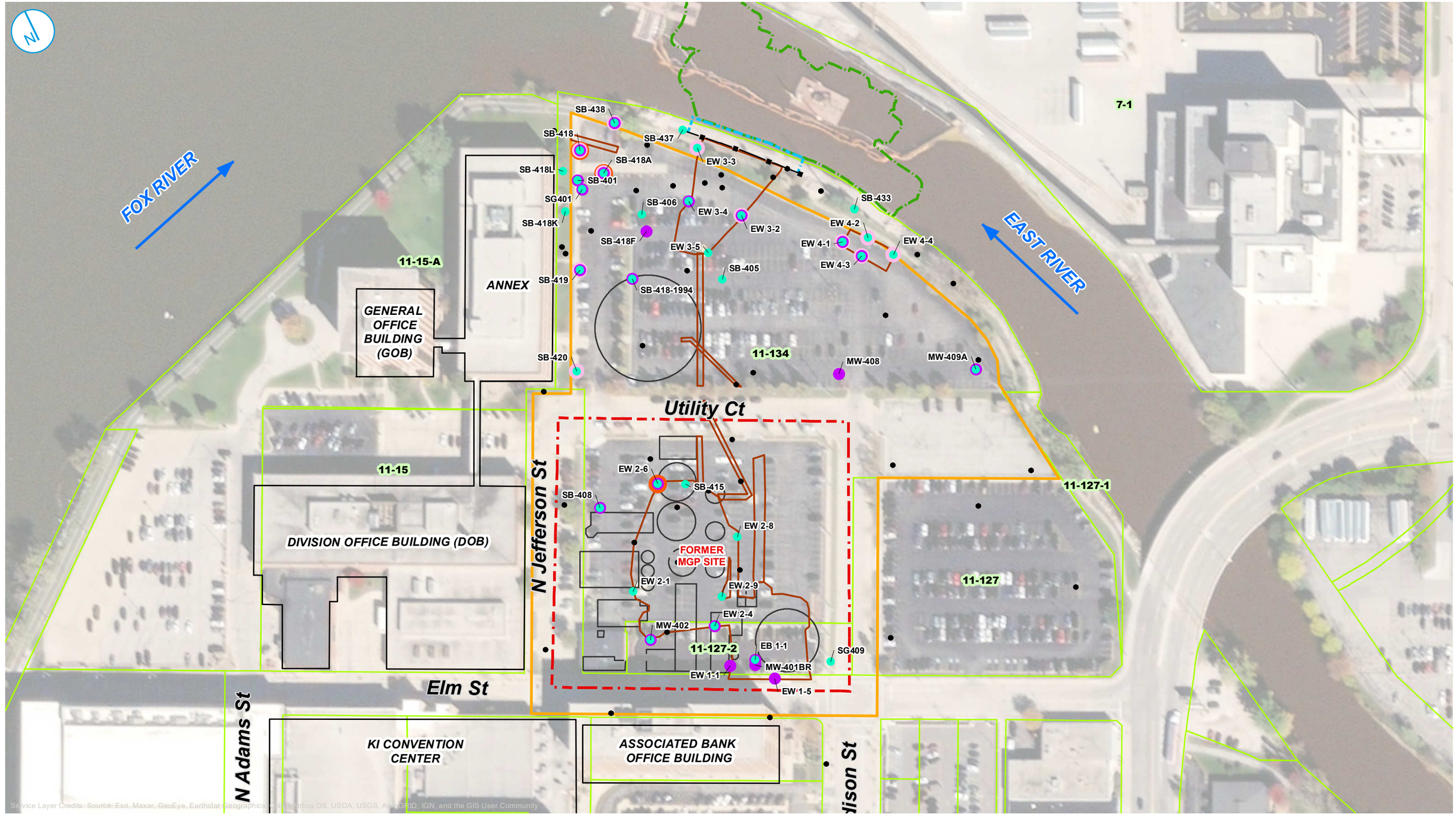
UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT FORMER GREEN BAY MANUFACTURED GAS PLANT

WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 10d

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



Y:\GIS\Projects\15\15884\MXD\RI_2020\Figure 10e_PAH Industrial greater than 4.mxd

PROJECT: 169000XXXX | DATED: 9/14/2020 | DESIGNER: galammc

CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)

0 62.5 125 Feet

BENZO(A)PYRENE EXCEEDANCE
NAPHTHALENE EXCEEDANCE
BENZO(A) ANTHRACENE, BENZO(B)FLUORANTHENE, DIBENZ(A,H)ANTHRACENE, OR INDENO(1,2,3-CD)PYRENE EXCEEDANCE
OTHER PAH EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

POST-REMEDIATION SOIL PAH EXCEEDANCES OF INDUSTRIAL SCREENING LEVELS GREATER THAN 4 FEET BELOW GROUND SURFACE

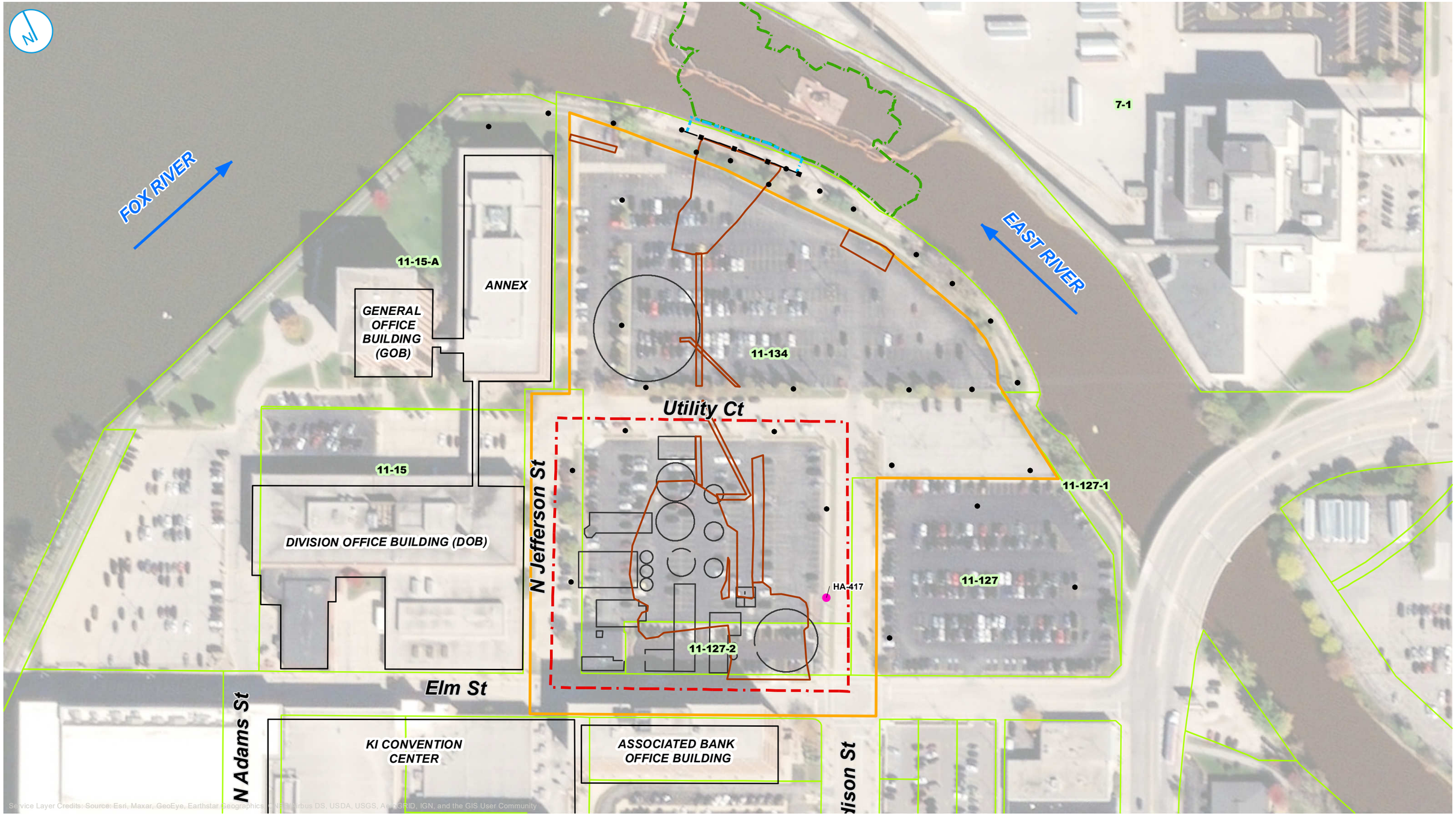
UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT FORMER GREEN BAY MANUFACTURED GAS PLANT

WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 10e

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
BENZENE EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

0 62.5 125 Feet

POST-REMEDIATION SOIL PVOC EXCEEDANCES OF RESIDENTIAL SCREENING LEVELS 0-0.5 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT FORMER GREEN BAY MANUFACTURED GAS PLANT

WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 11a

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
BENZENE EXCEEDANCE
ETHYLBENZENE EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

0 62.5 125 Feet

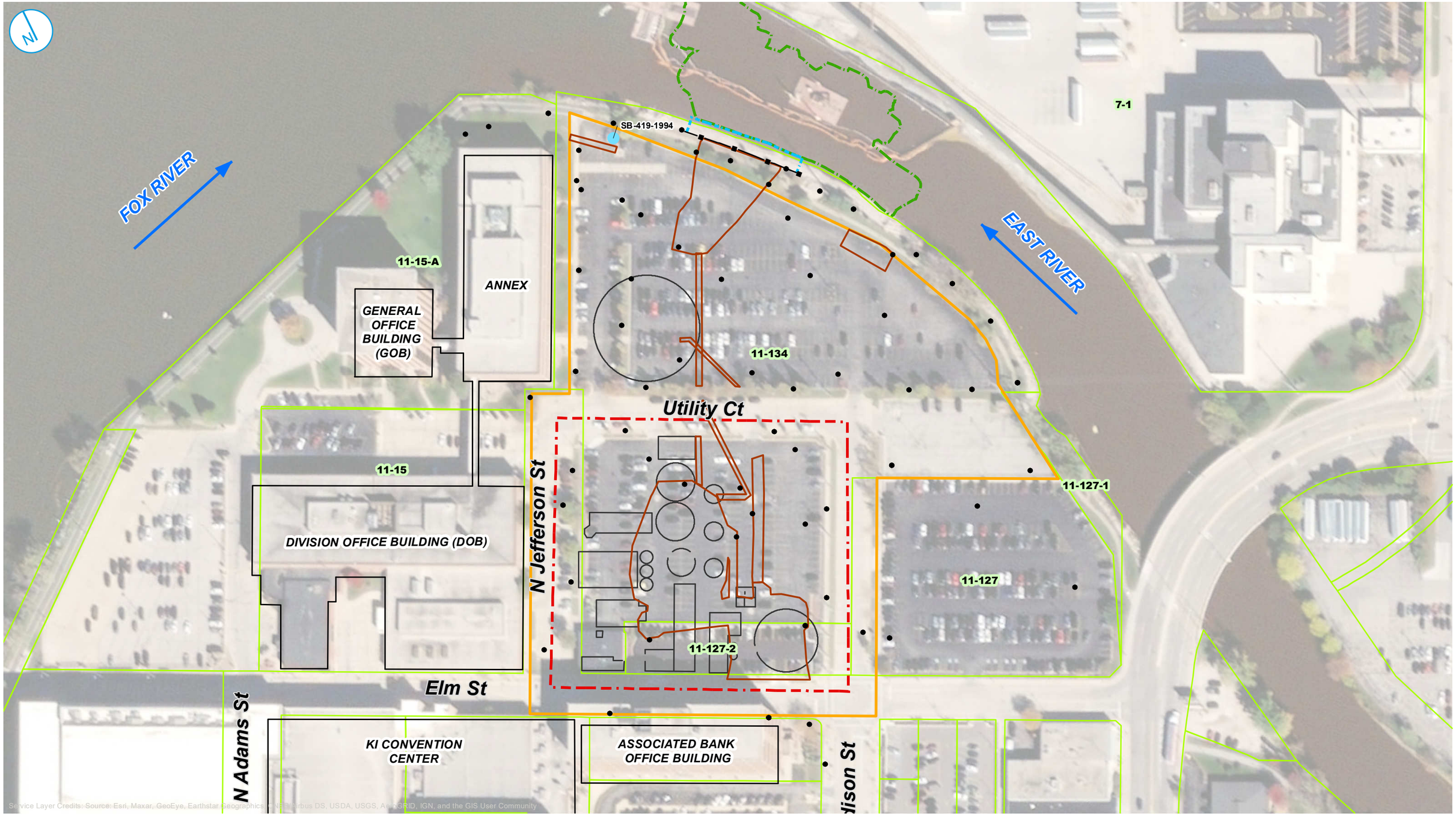
POST-REMEDIATION SOIL PVOC EXCEEDANCES OF RESIDENTIAL SCREENING LEVELS 0-4 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 11b

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
ETHYLBENZENE EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

0 62.5 125 Feet

POST-REMEDIATION SOIL PVOC EXCEEDANCES OF INDUSTRIAL SCREENING LEVELS 0-4 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 11c

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)

1,2,4-TRIMETHYLBENZENE EXCEEDANCE
BENZENE EXCEEDANCE
ETHYLBENZENE EXCEEDANCE
TOTAL XYLENES EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

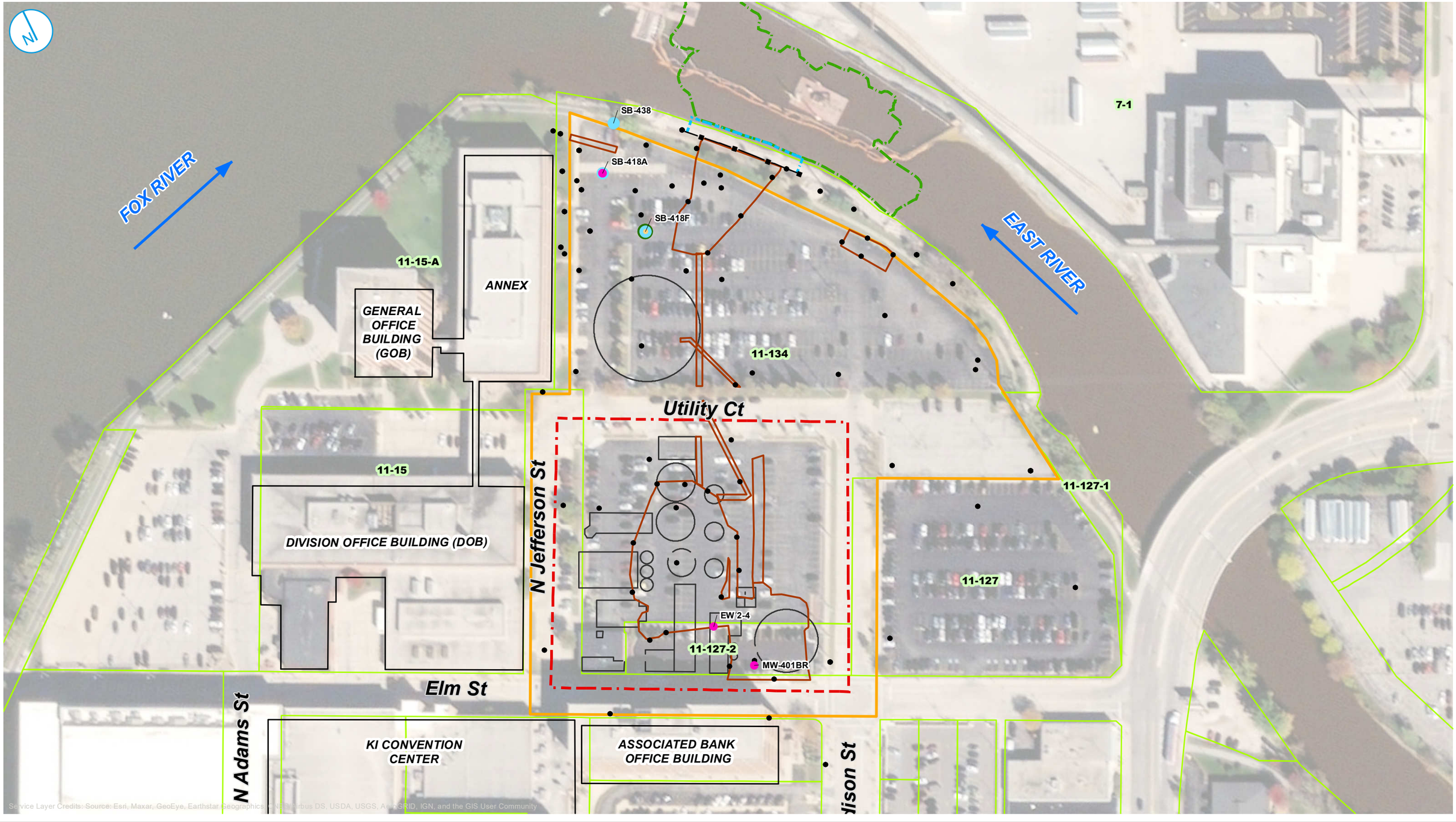
0 62.5 125 Feet

POST-REMEDIATION SOIL PVOC EXCEEDANCES OF RESIDENTIAL SCREENING LEVELS GREATER THAN 4 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 11d

RAMBOLL US CORPORATION
A RAMBOLL COMPANY
RAMBOLL



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)

1,2,4-TRIMETHYLBENZENE EXCEEDANCE
BENZENE EXCEEDANCE
ETHYLBENZENE EXCEEDANCE
TOTAL XYLENES EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

0 62.5 125 Feet

POST-REMEDIATION SOIL PVOC EXCEEDANCES OF INDUSTRIAL SCREENING LEVELS GREATER THAN 4 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT

WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 11e

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
TOTAL THALLIUM EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

0 62.5 125 Feet

POST-REMEDIATION SOIL INORGANIC EXCEEDANCES OF RESIDENTIAL SCREENING LEVELS 0-0.5 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT FORMER GREEN BAY MANUFACTURED GAS PLANT

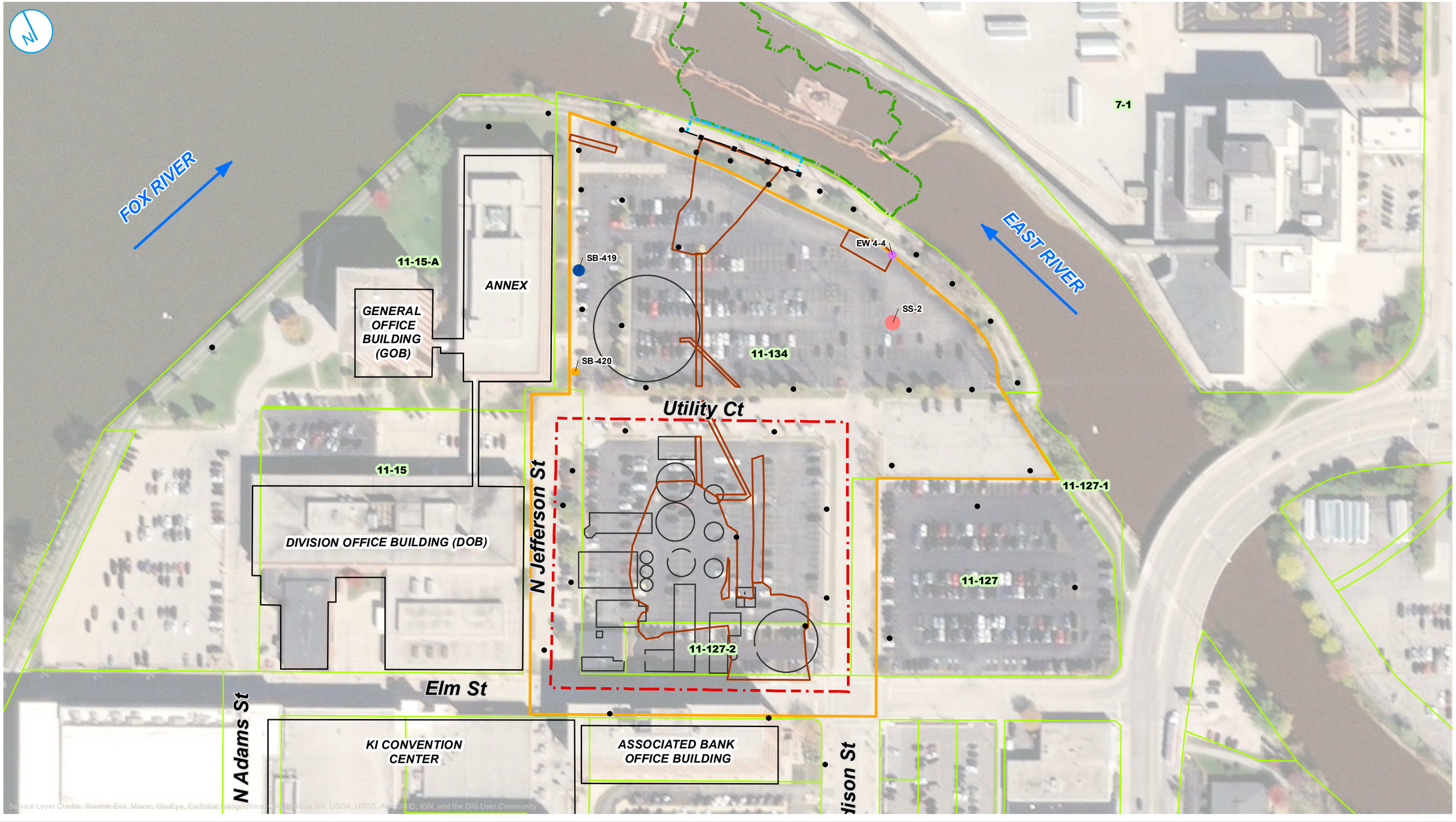
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 12a

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

Y:\GIS\Projects\151\1584\MXD\RI_2020\Figure 12b_Inorganic Residential 0-4.mxd



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CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)

TOTAL ARSENIC EXCEEDANCE
TOTAL CYANIDE/AMENDABLE CYANIDE EXCEEDANCE
TOTAL MERCURY EXCEEDANCE
TOTAL THALLIUM EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

0 62.5 125 Feet

POST-REMEDIATION SOIL INORGANIC EXCEEDANCES OF RESIDENTIAL SCREENING LEVELS 0-4 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 12b

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
TOTAL ARSENIC EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

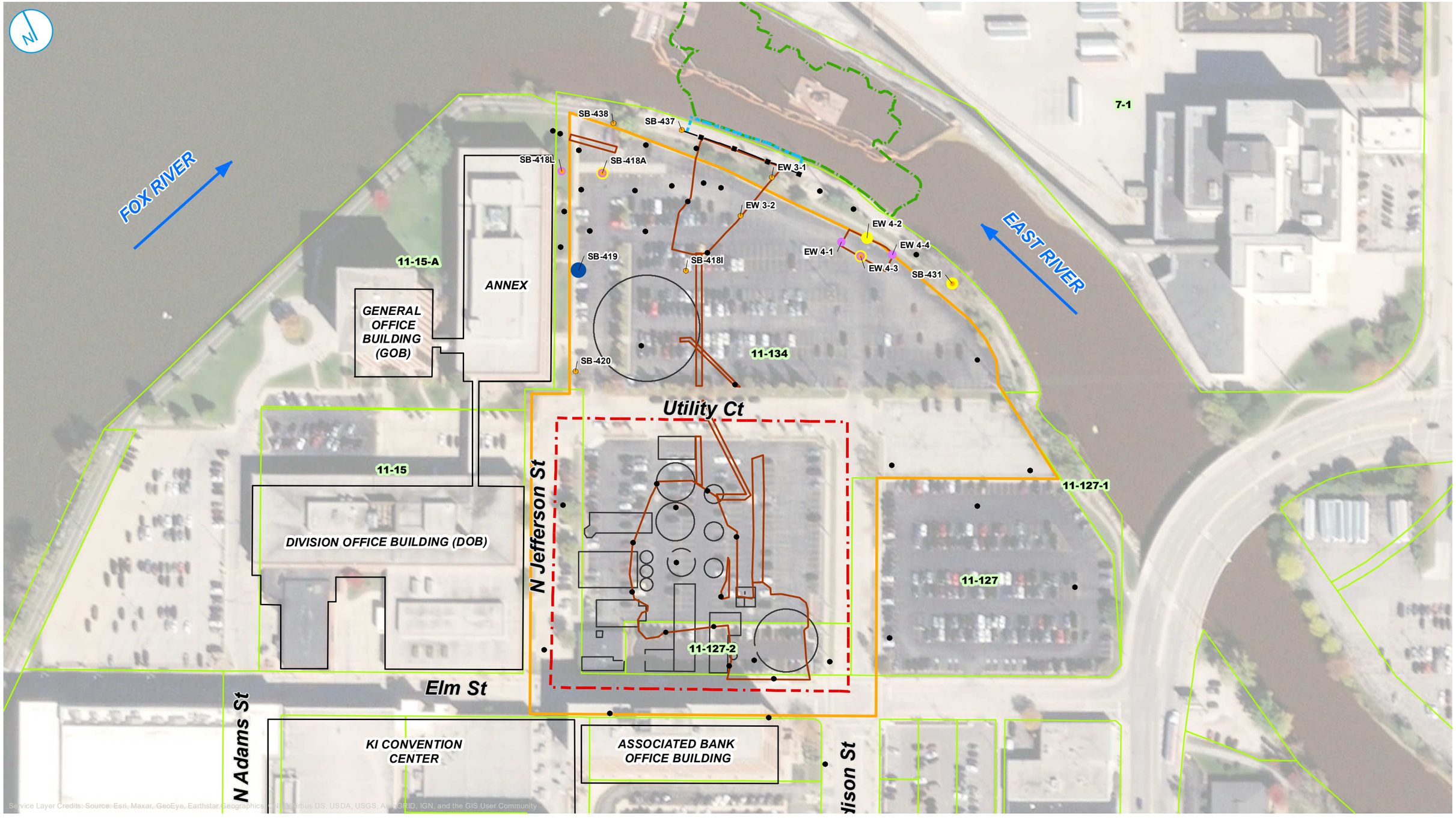
0 62.5 125 Feet

POST-REMEDIATION SOIL INORGANIC EXCEEDANCES OF INDUSTRIAL SCREENING LEVELS 0-4 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 12c

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
TOTAL ARSENIC EXCEEDANCE
TOTAL CYANIDE EXCEEDANCE
TOTAL LEAD EXCEEDANCE
TOTAL MERCURY EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

0 62.5 125 Feet

POST-REMEDIATION SOIL INORGANIC EXCEEDANCES OF RESIDENTIAL SCREENING LEVELS GREATER THAN 4 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 12d

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
TOTAL ARSENIC EXCEEDANCE
TOTAL CYANIDE EXCEEDANCE
TOTAL LEAD EXCEEDANCE
SOIL SAMPLING LOCATION WITHOUT EXCEEDANCE

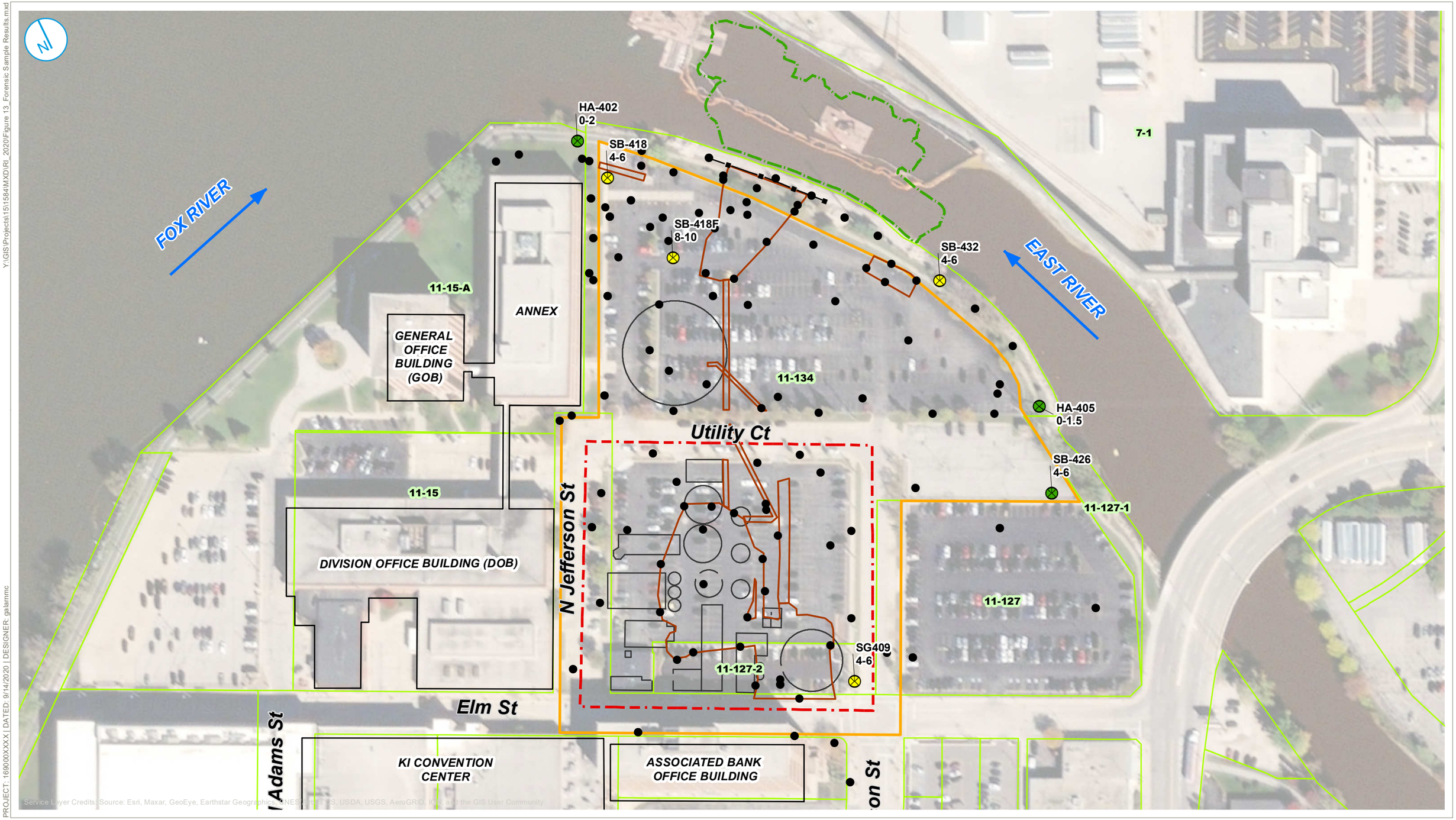
0 62.5 125 Feet

POST-REMEDIATION SOIL INORGANIC EXCEEDANCES OF INDUSTRIAL SCREENING LEVELS GREATER THAN 4 FEET BELOW GROUND SURFACE

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 12e

RAMBOLL US CORPORATION
A RAMBOLL COMPANY
RAMBOLL



Y:\GIS\Projects\15\11584\MXD\RI_2020\Figure 13_Forensic Sample Results.mxd

PROJECT: 169000XXXX | DATED: 9/14/2020 | DESIGNER: gaiarnmc

CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL

FORMER STRUCTURE
SOIL REMEDIATION EXCAVATION AREAS (2003)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)

0 75 150 Feet

URBAN BACKGROUND FORENSIC LOCATION
MGP RELATED FORENSIC ANALYSIS LOCATION
SAMPLING LOCATION

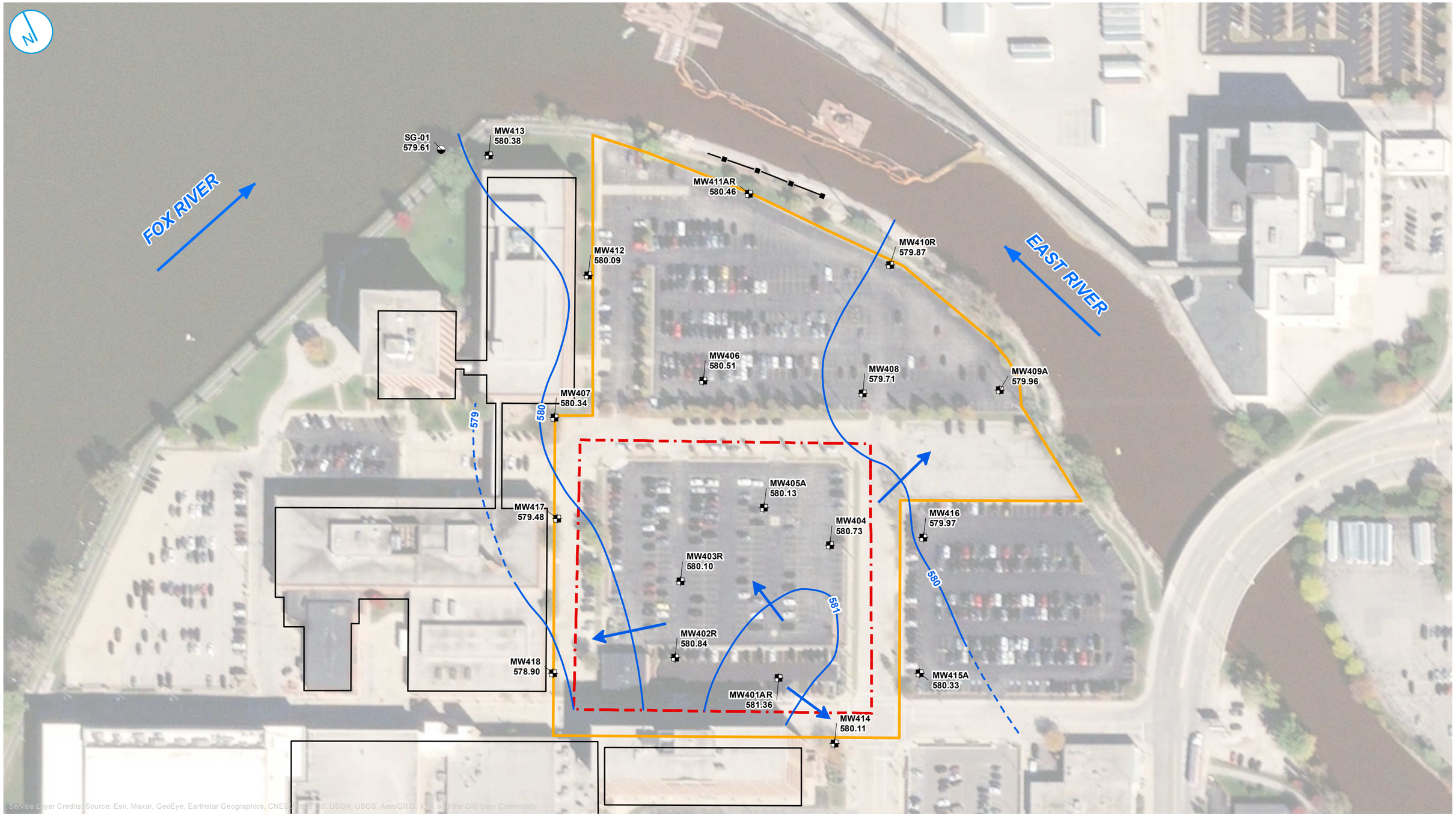
FORENSIC SAMPLE RESULTS

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 13

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



PROJECT: 169000XXXX | DATED: 9/14/2020 | DESIGNER: galarmmc

Y:\GIS\Projects\151584\MXD\RI_2020\Figure 14a_WT Contours 1511.mxd

CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT

MONITORING WELL
STAFF GAUGE
GROUNDWATER ELEVATION CONTOUR (FT)
INFERRED GROUNDWATER ELEVATION CONTOUR (FT)
GROUNDWATER FLOW DIRECTION

0 62.5 125 Feet

Notes
1. ELEVATIONS OF NEIGHBORING WELLS SUGGEST THE WATER ELEVATION AT MW411AR IS ANOMOLOUS
2. STAFF GAUGE LOCATION IS APPROXIMATE
NM = NOT MEASURED
ELEVATIONS IN PARENTHESIS WERE NOT USED FOR CONTOURS

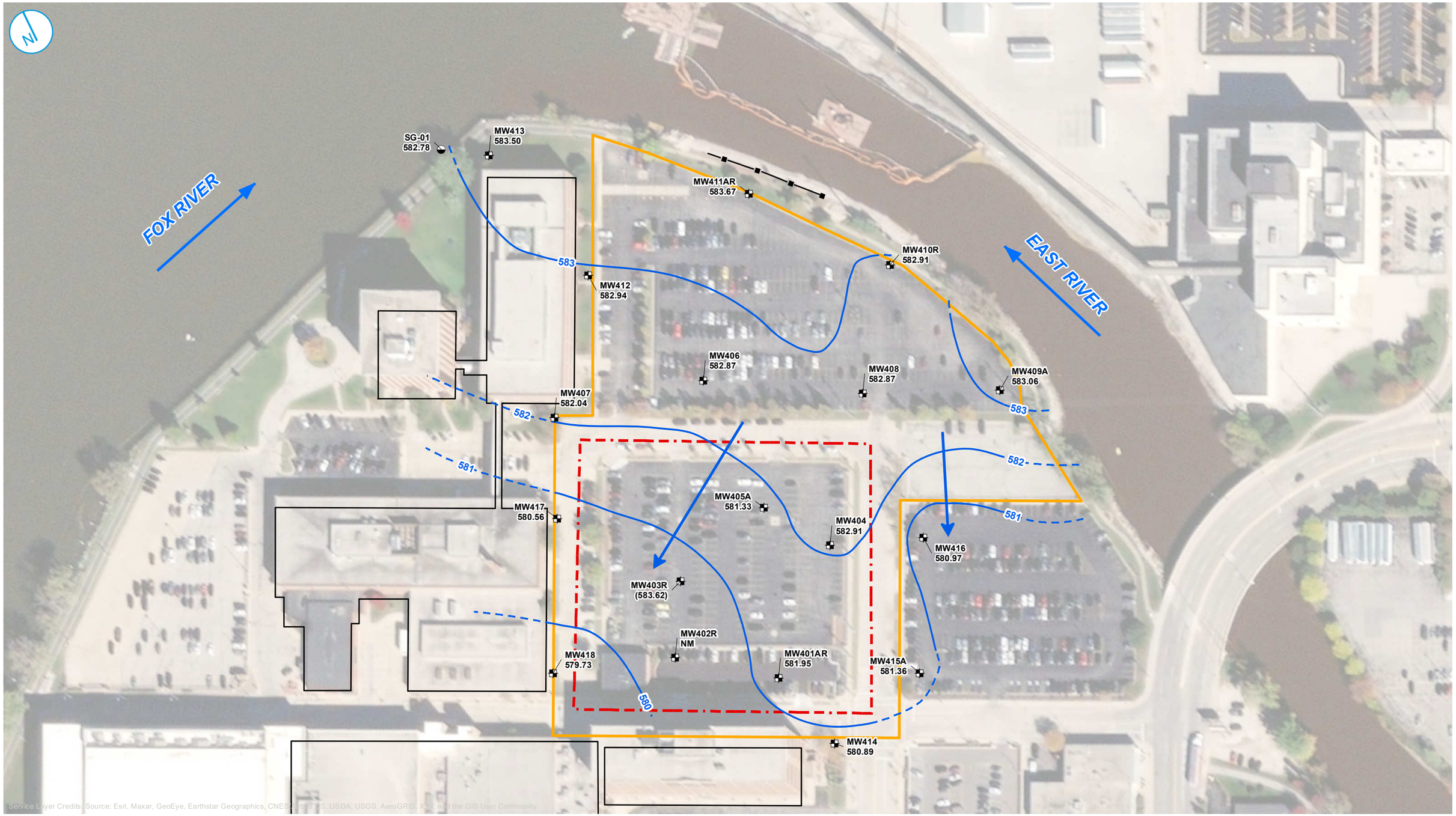
WATER TABLE CONTOUR MAP NOVEMBER 9-10TH, 2015

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 14a

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



CAP MAINTENANCE AREA
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT
MONITORING WELL
STAFF GAUGE
GROUNDWATER ELEVATION CONTOUR (FT)
INFERRED GROUNDWATER ELEVATION CONTOUR (FT)
GROUNDWATER FLOW DIRECTION

0 62.5 125 Feet

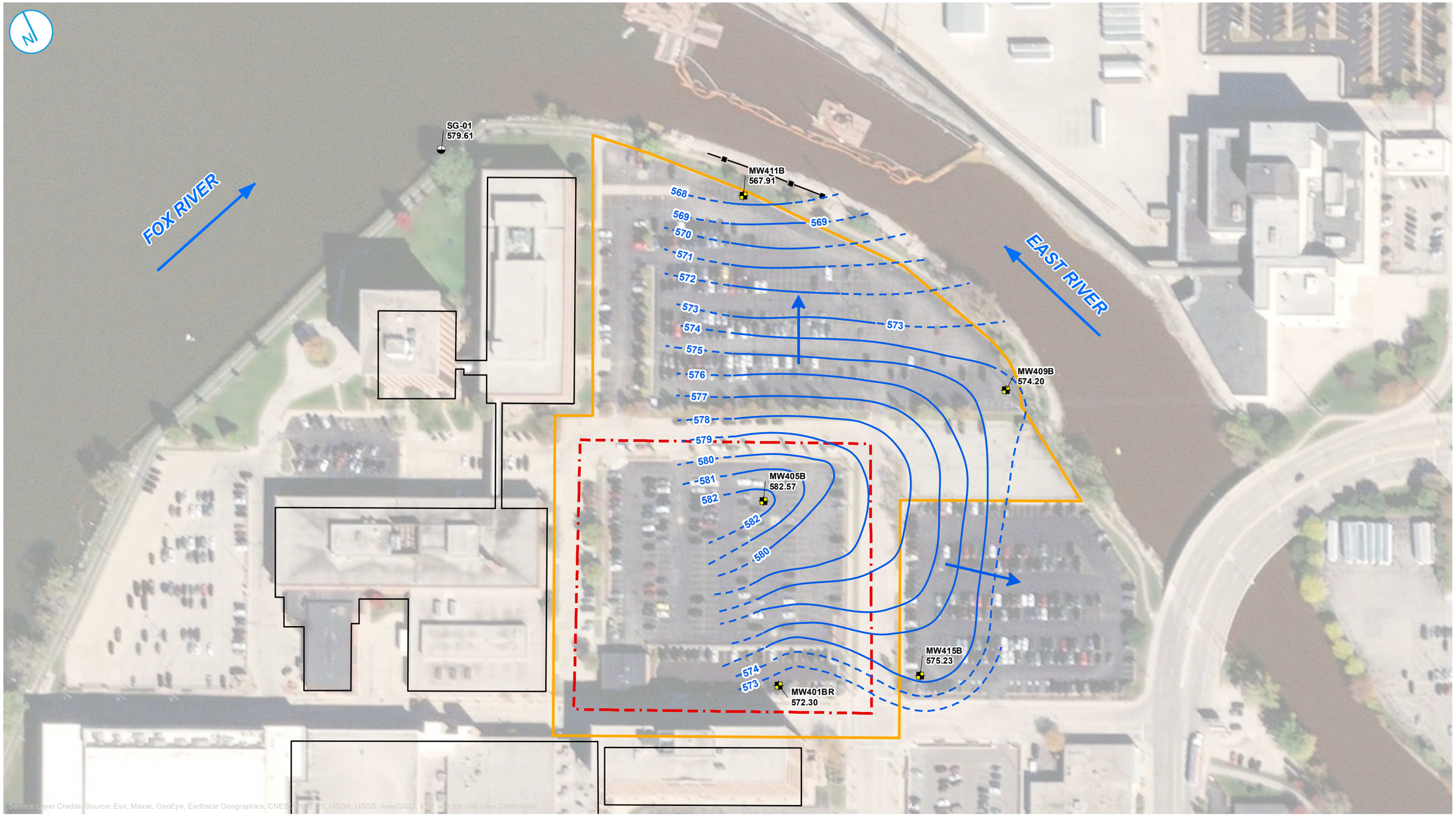
Notes
1. ELEVATIONS OF NEIGHBORING WELLS SUGGEST THE WATER ELEVATION AT MW411AR IS ANOMOLOUS
2. STAFF GAUGE LOCATION IS APPROXIMATE
NM = NOT MEASURED
ELEVATIONS IN PARENTHESIS WERE NOT USED FOR CONTOURS

WATER TABLE CONTOUR MAP MAY 26, 2020

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 14b

RAMBOLL US CORPORATION
A RAMBOLL COMPANY
RAMBOLL



- CAP MAINTENANCE
- FORMER MGP SITE
- SHEET PILE WALL
- BUILDING FOOTPRINT
- PIEZOMETER
- STAFF GAUGE
- GROUNDWATER ELEVATION CONTOUR (FT)
- INFERRED GROUNDWATER ELEVATION CONTOUR (FT)
- GROUNDWATER FLOW DIRECTION

0 62.5 125 Feet

Notes
1. STAFF GAUGE LOCATION IS APPROXIMATE

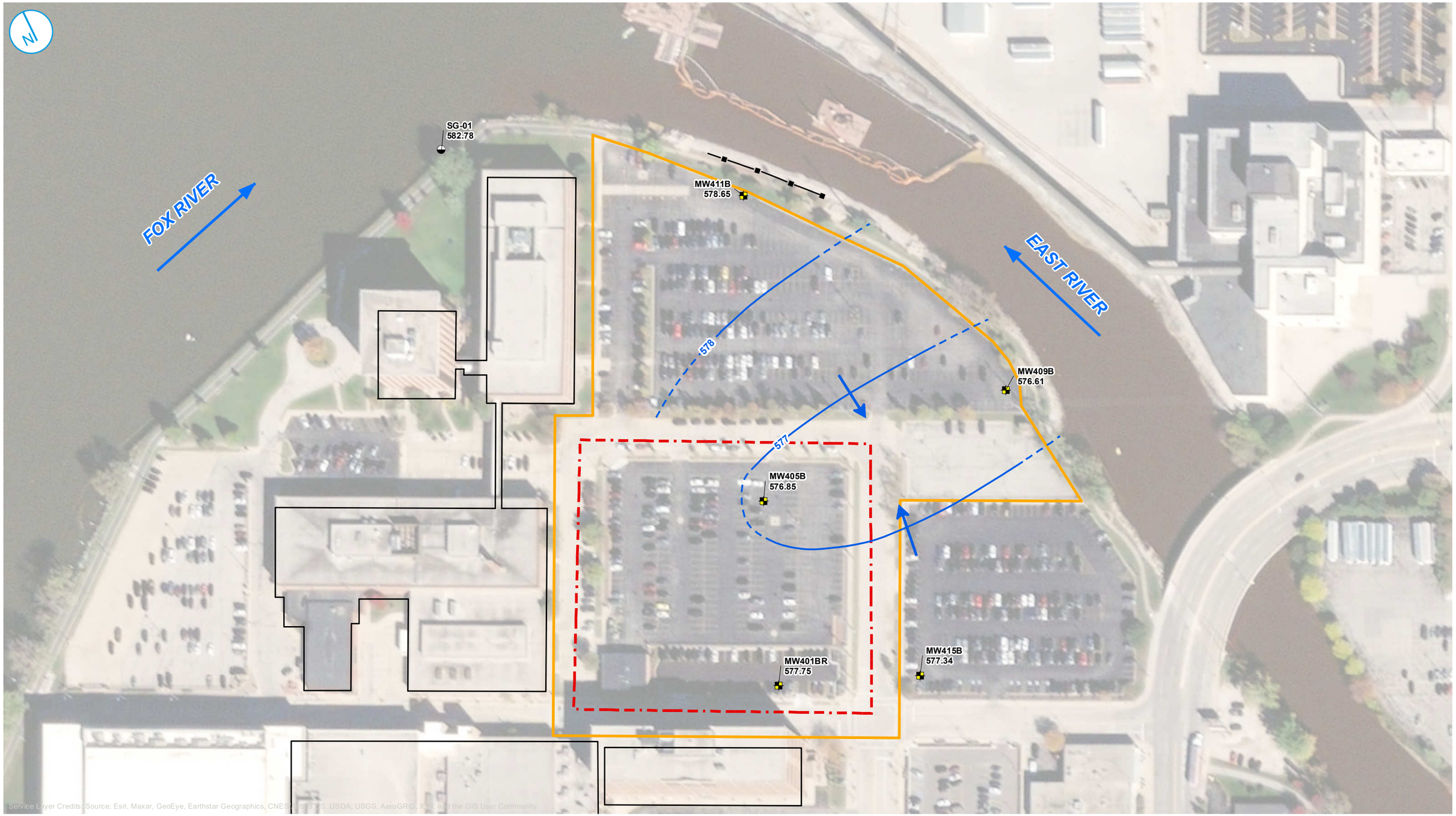
POTENTIMETRIC CONTOUR MAP NOVEMBER 9-10TH, 2015

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 15a

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



CAP MAINTENANCE
FORMER MGP SITE
SHEET PILE WALL
BUILDING FOOTPRINT

PIEZOMETER
STAFF GAUGE
GROUNDWATER ELEVATION CONTOUR (FT)
INFERRED GROUNDWATER ELEVATION CONTOUR (FT)
GROUNDWATER FLOW DIRECTION

0 62.5 125 Feet

Notes
1. STAFF GAUGE LOCATION IS APPROXIMATE

POTENTIMETRIC CONTOUR MAP MAY 26, 2020

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 15b

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

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PROJECT: 1690000XXXX | DATED: 9/14/2020 | DESIGNER: galarmmc

C:\GB_TEMP__\GB_TEMPMXD\RI_2020\Figure 16_GW Benzene Iso Map.mxd

PROJECT: 169000XXXX | DATED: 9/15/2020 | DESIGNER: GALARNMC

Note
TIME SERIES GRAPHS ARE NOT PRESENTED FOR MONITORING WELLS WITH GREATER THAN 50% NON-DETECT VALUES.

FOX RIVER

EAST RIVER

SG-01
MW413
MW412
MW410R
MW408
MW409A
MW417
MW416
MW418
MW415A
MW414

MW-411AR
MW-406
MW-407
MW-405A
MW-403R
MW-404
MW-402R
MW-401AR

CONCENTRATION (Y AXIS) SCALE VARIATION

ANALYTICAL RESULT (ug/L) log 0 - 100,000
SAMPLING DATE SCALE
LOCATION
ANALYTICAL SAMPLING RESULT AND DATE
RISK ASSESSMENT FRAMEWORK GROUNDWATER SCREENING LEVEL
WISCONSIN PREVENTIVE ACTION LIMIT

ANALYTICAL RESULT (ug/L) log 0 - 10,000,000
SAMPLING DATE SCALE
LOCATION
ANALYTICAL SAMPLING RESULT AND DATE
RISK ASSESSMENT FRAMEWORK GROUNDWATER SCREENING LEVEL
WISCONSIN PREVENTIVE ACTION LIMIT

ANALYTICAL RESULT (ug/L) log 0 - 20
SAMPLING DATE SCALE
LOCATION
RISK ASSESSMENT FRAMEWORK GROUNDWATER SCREENING LEVEL
ANALYTICAL SAMPLING RESULT AND DATE
WISCONSIN PREVENTIVE ACTION LIMIT

- STAFF GAUGE
- MONITORING WELL
- ABANDONED MONITORING WELL/PIEZOMETER
- PIEZOMETER

0 62.5 125 Feet

- FORMER MGP SITE
- BUILDING FOOTPRINT

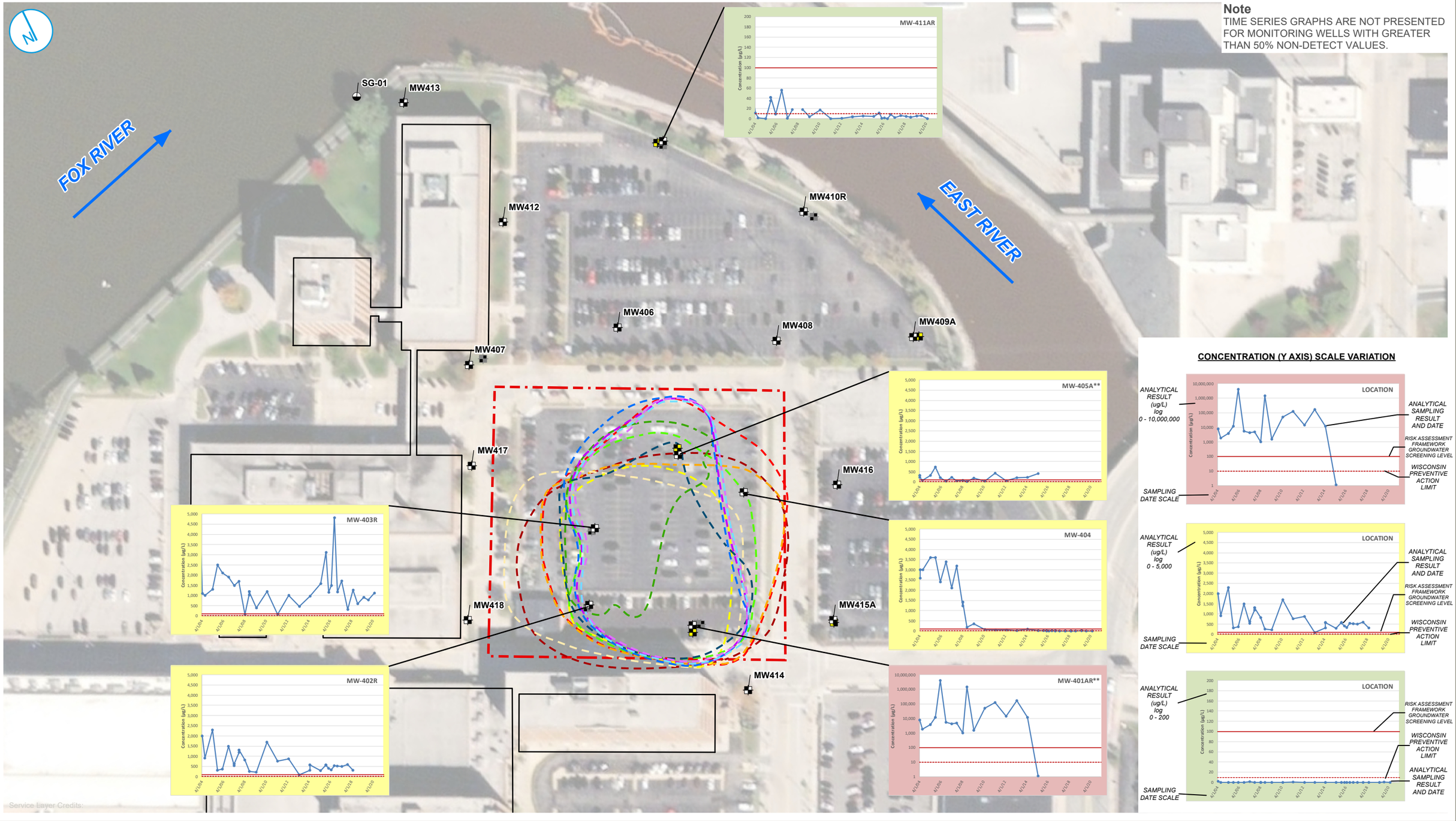
TIME PERIOD BENZENE ISOCONTOUR AT SCREENING LEVEL (5 ug/L)
- MAY 2004
- MAY 2006
- MAY 2008
- MAY 2010
- MAY 2012
- MAY 2014
- MAY 2015
- MAY 2016
- MAY 2017
- MAY 2018
- MAY 2019
- MAY 2020

SHALLOW GROUNDWATER BENZENE ISOCONCENTRATION MAP

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 16

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



Note
TIME SERIES GRAPHS ARE NOT PRESENTED FOR MONITORING WELLS WITH GREATER THAN 50% NON-DETECT VALUES.

CONCENTRATION (Y AXIS) SCALE VARIATION

- STAFF GAUGE
- MONITORING WELL
- ABANDONED MONITORING WELL/PIEZOMETER
- PIEZOMETER

0 62.5 125 Feet

- FORMER MGP SITE
- BUILDING FOOTPRINT

TIME PERIOD NAPHTHALENE ISOCONTOUR AT SCREENING LEVEL (100 ug/L)

- MAY 2004
- MAY 2006
- MAY 2008
- MAY 2010
- MAY 2012
- MAY 2014
- MAY 2015
- MAY 2016
- MAY 2017
- MAY 2018
- MAY 2019
- MAY 2020

Notes
** = DENSE NON-AQUEOUS PHASE LIQUID PRESENT IN MONITORING WELL

SHALLOW GROUNDWATER NAPHTHALENE ISOCONCENTRATION MAP

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 17

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

C:\Users\galammc\OneDrive - Ramboll\desktop\GB_TEMP__\GB_TEMP\MXD\RI_2020\Figure 18_GW BaP Iso Map.mxd

PROJECT: 169000XXXX | DATED: 9/15/2020 | DESIGNER: GALARNMC

FOX RIVER

EAST RIVER

SG-01

MW413

MW412

MW410R

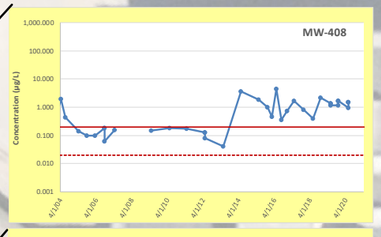
MW407

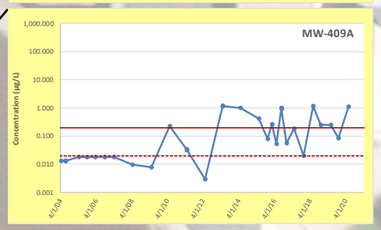
MW417

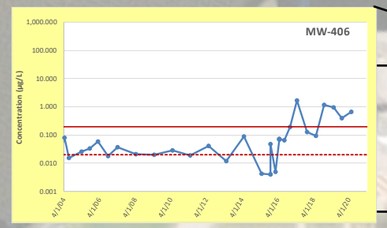
MW418

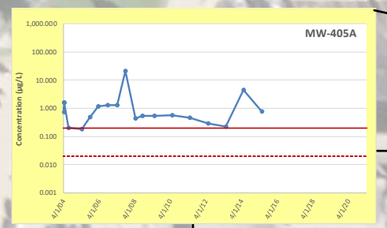
MW414

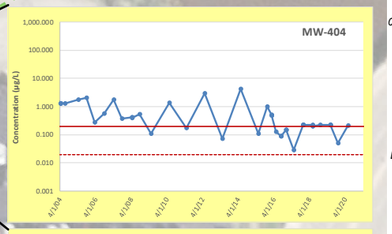
Note
TIME SERIES GRAPHS ARE NOT PRESENTED FOR MONITORING WELLS WITH GREATER THAN 50% NON-DETECT VALUES.

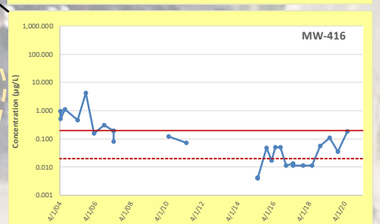


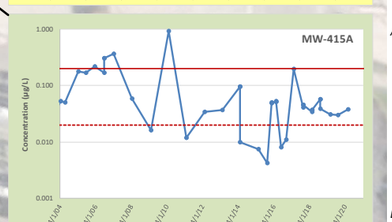


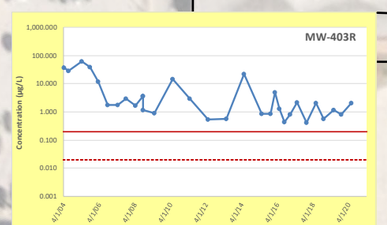


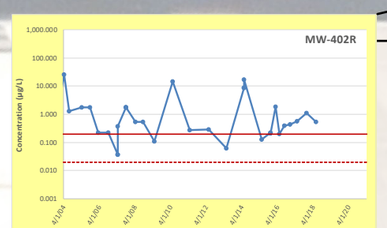


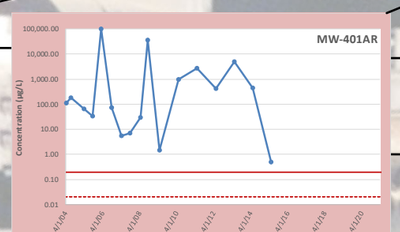






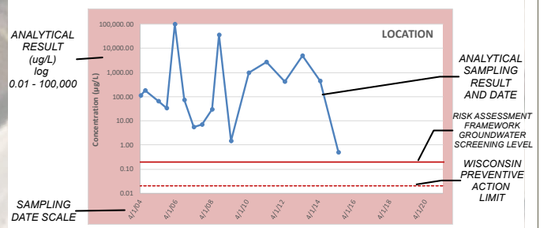


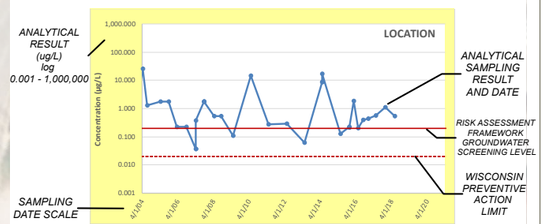


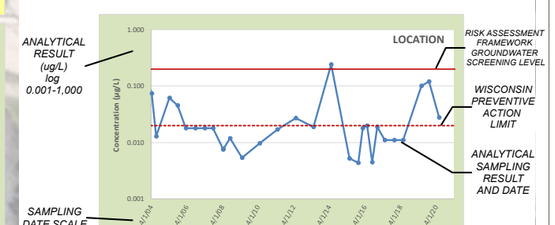


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

CONCENTRATION (Y AXIS) SCALE VARIATION







- STAFF GAUGE
- MONITORING WELL
- ABANDONED MONITORING WELL/PIEZOMETER
- PIEZOMETER

0 62.5 125 Feet

- FORMER MGP SITE
- BUILDING FOOTPRINT

TIME PERIOD BENZO(A)PYRENE ISOCONTOUR AT SCREENING LEVEL (0.2 ug/L)

- MAY 2004
- MAY 2006
- MAY 2008
- MAY 2010
- MAY 2012
- MAY 2013
- MAY 2014
- MAY 2015
- MAY 2016
- MAY 2017
- MAY 2018
- MAY 2019
- MAY 2020

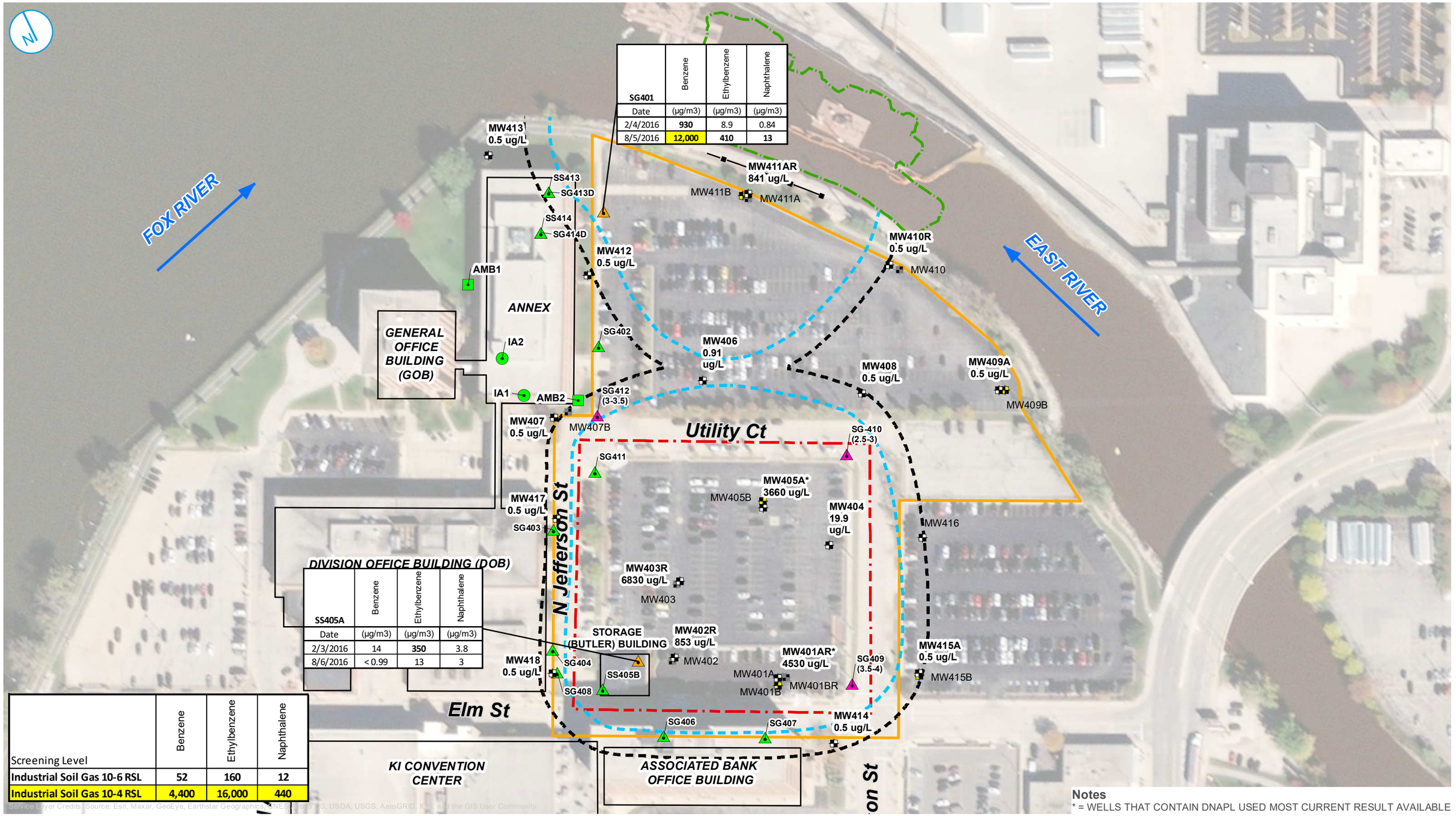
Notes
** = DENSE NON-AQUEOUS PHASE LIQUID PRESENT IN MONITORING WELL

SHALLOW GROUNDWATER BENZO(A)PYRENE ISOCONCENTRATION MAP

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 18

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



SG401	Benzene	Ethylbenzene	Naphthalene
Date	(µg/m3)	(µg/m3)	(µg/m3)
2/4/2016	**930**	8.9	0.84
8/5/2016	**12,000**	**410**	**13**

SS405A	Benzene	Ethylbenzene	Naphthalene
Date	(µg/m3)	(µg/m3)	(µg/m3)
2/3/2016	14	**350**	3.8
8/6/2016	< 0.99	13	3

Screening Level	Benzene	Ethylbenzene	Naphthalene
Industrial Soil Gas 10-6 RSL	**52**	**160**	**12**
Industrial Soil Gas 10-4 RSL	**4,400**	**16,000**	**440**

Notes
* = WELLS THAT CONTAIN DNAPL USED MOST CURRENT RESULT AVAILABLE

- CAP MAINTENANCE AREA
- FORMER MGP SITE
- SHEET PILE WALL
- BUILDING FOOTPRINT
- SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)

0 62.5 125 Feet

- INDOOR AIR SAMPLE WITHOUT
- AMBIENT AIR SAMPLE WITHOUT EXCEEDANCE
- MONITORING WELL AND BENZENE CONCENTRATION (ug/L)
- ABANDONED MONITORING WELL/PIEZOMETER
- PIEZOMETER

- SOIL GAS SAMPLE EXCEEDANCE
- SOIL GAS SAMPLE WITHOUT EXCEEDANCE
- NO SAMPLE COLLECTED DUE TO WATER IN LINES (SAMPLE DEPTH SHOWN)
- BENZENE ISOCONCENTRATION 1.6 ug/L: RESIDENTIAL GROUNDWATER TO VAPOR SL (RAF ADDENDUM REV 5, 2016)
- 35 FOOT BUFFER

VAPOR INTRUSION PATHWAY EVALUATION WITH BENZENE GROUNDWATER RESULTS

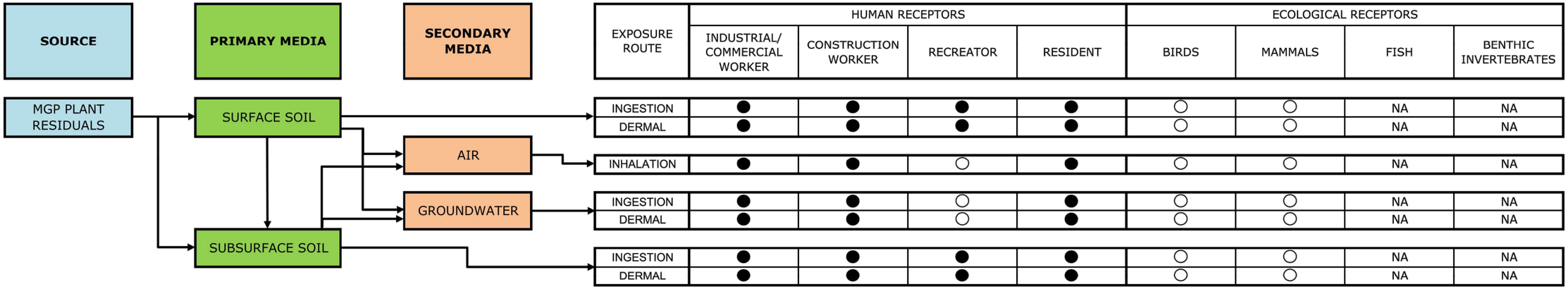
UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 19

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

PROJECT: 1690000XXXX | DATED: 9/15/2020 | DESIGNER: galanmc
Y:\GIS\Projects\15\11584\MXD\RI_2020\Figure 19_VI Pathway Eval wBenzene GW.mxd



EXPOSURE ROUTE	HUMAN RECEPTORS				ECOLOGICAL RECEPTORS			
	INDUSTRIAL/ COMMERCIAL WORKER	CONSTRUCTION WORKER	RECREATOR	RESIDENT	BIRDS	MAMMALS	FISH	BENTHIC INVERTEBRATES
INGESTION	●	●	●	●	○	○	NA	NA
DERMAL	●	●	●	●	○	○	NA	NA
INHALATION	●	●	○	●	○	○	NA	NA
INGESTION	●	●	○	●	○	○	NA	NA
DERMAL	●	●	○	●	○	○	NA	NA
INGESTION	●	●	●	●	○	○	NA	NA
DERMAL	●	●	●	●	○	○	NA	NA

Notes:

1. This site-specific Conceptual Site Model was developed based on observations made during site reconnaissance, review of remedial investigation data, and the Generalized Conceptual Site Model Revision 0, dated September 4, 2007 and approved by US EPA on December 20, 2007.
2. Exposure assumptions are presented in the Multi-Site Risk Assessment Framework Revision 0, dated September 5, 2007 and approved by USEPA on December 20, 2007.
3. Groundwater ingestion is not expected under current or future land use because there is a public water supply. Groundwater will be qualitatively evaluated using state and federal drinking water standards as presented in the RAF.
4. MGP residuals, including non-aqueous phase liquid (NAPL), were released during MGP operations which ceased in 1947.
5. Source removal of NAPL was completed in 2003. Surface and subsurface soils are currently controlled within the capped area following removal action. Trace NAPL remains in the subsurface clay. NAPL is also present in the subsurface in the north parking lot near the Annex building and was observed in a couple borings north of the cap maintenance area that is the subject of proposed Early Removal Action. Residual concentrations of COPCs remain in the surface and subsurface soils, and groundwater.
6. Sediment and Surface Water risks will be discussed in the Remedial Investigation Report for the former Green Bay Sediments (OU2).

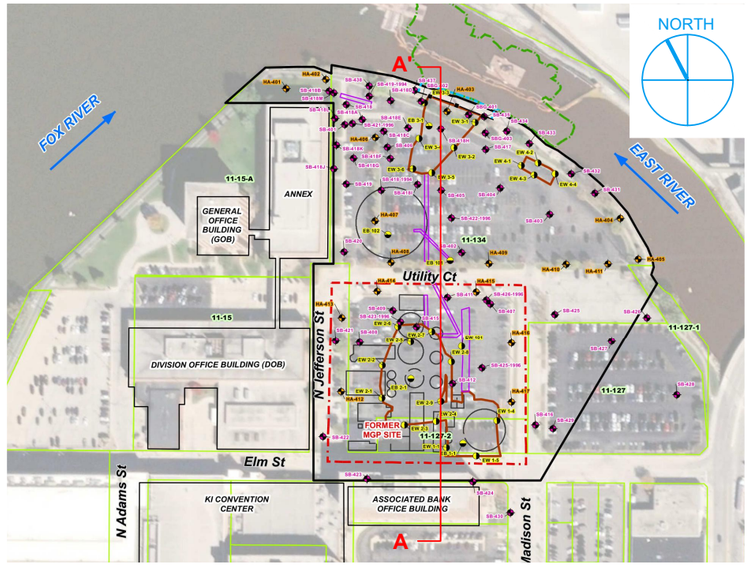
○ = Pathway incomplete
● = Pathway potentially complete
NA = Not applicable

SITE SPECIFIC ONCEPTUAL SITE MODEL

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT SITE
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 20

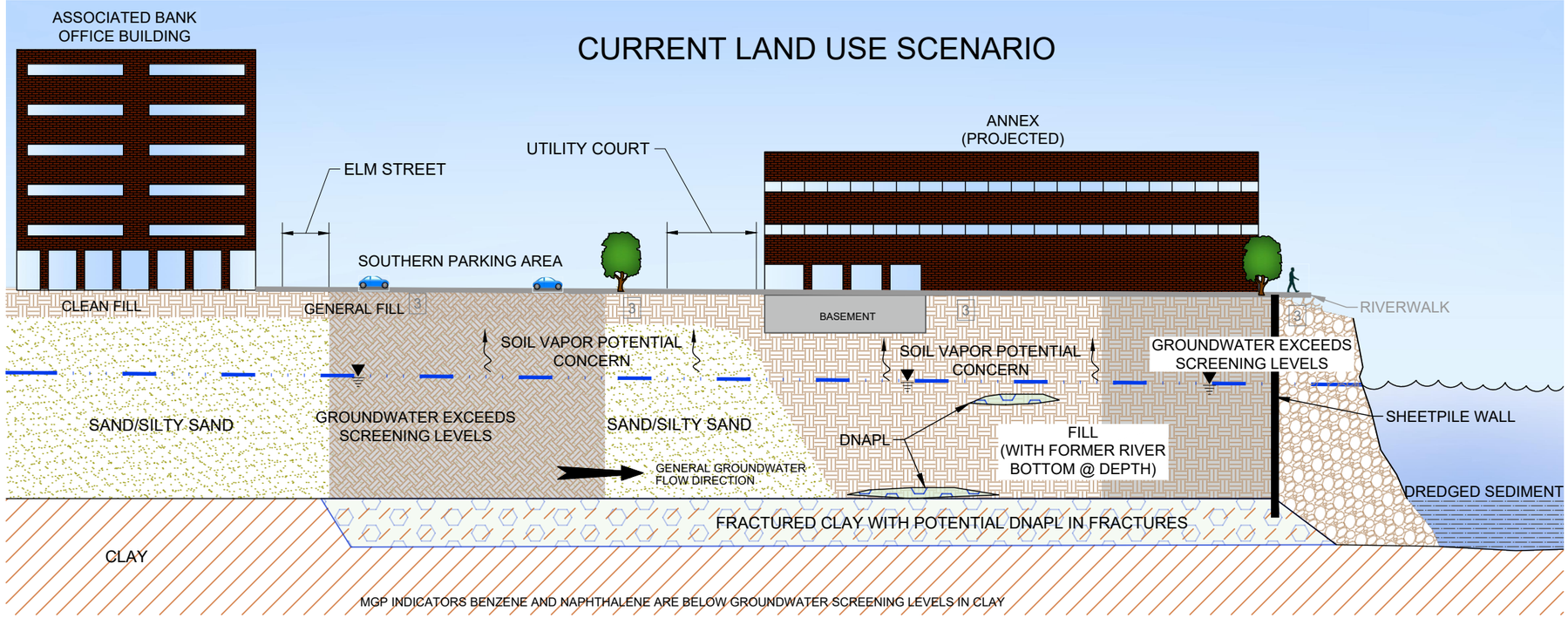
RAMBOLL US CORPORATION
A RAMBOLL COMPANY



NOTES

1. CROSS SECTION REPRESENTS A GENERALIZED INTERPRETATION OF SUBSURFACE CONDITIONS.
2. RIVER SEDIMENT WAS DREDGED.
3. SURFACE AND SUB-SURFACE SOIL RISKS EXCEED THE UPPER END OF THE RISK MANAGEMENT CRITERIA IN SOME LOCATIONS OUTSIDE OF 2003 AND 2018 REMOVAL AREAS. WITHIN THE REMOVAL AREAS SOIL RISKS DO NOT EXCEED THE UPPER END OF THE RISK MANAGEMENT CRITERIA.
4. GRASSY MEDIANS OCCASIONALLY OCCUR BETWEEN PARKING LOTS AND STREETS.
5. NOT TO SCALE.

CURRENT LAND USE SCENARIO



NOT TO SCALE

LEGEND

- FILL
- SAND/SILTY SAND
- CLAY
- FRACTURED CLAY
- DREDGED SEDIMENT
- EXCAVATED SHORELINE (2018)
- SOIL REMEDIATION EXCAVATION AND BACKFILLED WITH THERMALLY TREATED MATERIALS (2003)
- DNAPL
- GROUNDWATER TABLE

GRAPHICAL CONCEPTUAL SITE MODEL

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT SITE
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

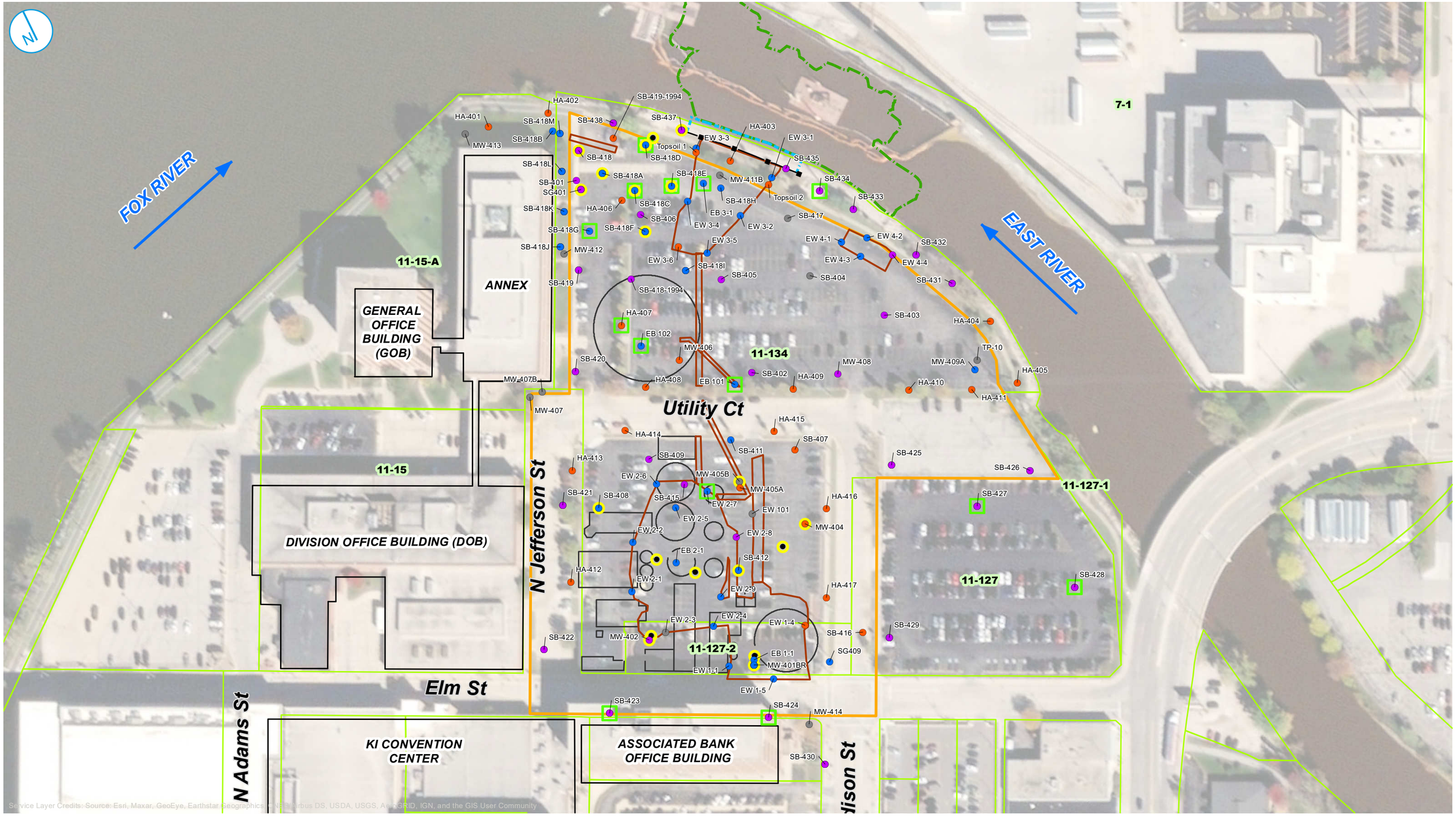
FIGURE 21

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

Y:\GIS\Projects\151\1584\MXD\RI_2020\Figure 22_Estimated Extent of Soil CR_10-6.mxd

PROJECT: 169000XXXX | DATED: 9/17/2020 | DESIGNER: galammc



CAP MAINTENANCE AREA
SHEET PILE WALL
BUILDING FOOTPRINT
TAX PARCEL
FORMER STRUCTURE

0 62.5 125 Feet

SOIL REMEDIATION EXCAVATION AREAS (2003)
SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
OIL WETTED-COATED MATERIAL OBSERVED WITHIN BORING
OIL WETTED-COATED MATERIAL OBSERVED WITHIN BORING (NO ANALYTICAL)

LOCATION WITH CUMULATIVE CANCER RISK LESS THAN 10^{-6} AND A HAZARD INDEX LESS THAN 1.0
LOCATION WITH CUMULATIVE RISK EXCEEDANCE FOR SHALLOW SAMPLES (FROM 0 TO 4 FEET BELOW GROUND SURFACE INTERVAL)
LOCATION WITH CUMULATIVE RISK EXCEEDANCE FOR DEEP SAMPLES (DEEPER THAN 4 FEET BELOW GROUND SURFACE)
LOCATION WITH CUMULATIVE RISK EXCEEDANCE FOR BOTH SHALLOW AND DEEP SAMPLES
ARSENIC IS THE ONLY IDENTIFIED RISK DRIVER AND TOTAL CONCENTRATION IS BELOW 8 mg/kg

ESTIMATED EXTENT OF SOIL CR > 10^{-6} OR HI>1: RESIDENTIAL

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 22

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

- CAP MAINTENANCE AREA
- SHEET PILE WALL
- BUILDING FOOTPRINT
- TAX PARCEL
- FORMER STRUCTURE
- SOIL REMEDIATION EXCAVATION AREAS (2003)
- SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
- SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
- OIL WETTED-COATED MATERIAL OBSERVED WITHIN BORING
- OIL WETTED-COATED MATERIAL OBSERVED WITHIN BORING (NO ANALYTICAL)
- LOCATION WITH CUMULATIVE CANCER RISK LESS THAN 10^{-5} AND A HAZARD INDEX LESS THAN 1.0
- LOCATION WITH CUMULATIVE RISK EXCEEDANCE FOR SHALLOW SAMPLES (FROM 0 TO 4 FEET BELOW GROUND SURFACE INTERVAL)
- LOCATION WITH CUMULATIVE RISK EXCEEDANCE FOR DEEP SAMPLES (DEEPER THAN 4 FEET BELOW GROUND SURFACE)
- LOCATION WITH CUMULATIVE RISK EXCEEDANCE FOR BOTH SHALLOW AND DEEP SAMPLES

0 62.5 125 Feet

ESTIMATED EXTENT OF SOIL CR > 10^{-5} OR HI>1: RESIDENTIAL

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 23

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

- CAP MAINTENANCE AREA
- SHEET PILE WALL
- BUILDING FOOTPRINT
- TAX PARCEL
- FORMER STRUCTURE

0 62.5 125 Feet

- SOIL REMEDIATION EXCAVATION AREAS (2003)
- SOUTH FOCUS AREA (REMEDIAL ACTION COMPLETED IN 2018)
- SHORELINE EXCAVATION EXTENT (REMEDIAL ACTION COMPLETED IN 2018)
- OIL WETTED-COATED MATERIAL OBSERVED WITHIN BORING
- OIL WETTED-COATED MATERIAL OBSERVED WITHIN BORING (NO ANALYTICAL)

- LOCATION WITH CUMULATIVE CANCER RISK LESS THAN 10^{-4} AND A HAZARD INDEX LESS THAN 1.0
- LOCATION WITH CUMULATIVE RISK EXCEEDANCE FOR SHALLOW SAMPLES (FROM 0 TO 4 FEET BELOW GROUND SURFACE INTERVAL)
- LOCATION WITH CUMULATIVE RISK EXCEEDANCE FOR DEEP SAMPLES (DEEPER THAN 4 FEET BELOW GROUND SURFACE)
- LOCATION WITH CUMULATIVE RISK EXCEEDANCE FOR BOTH SHALLOW AND DEEP SAMPLES

ESTIMATED EXTENT OF SOIL CR > 10^{-4} OR HI>1: RESIDENTIAL

UPLAND REMEDIAL INVESTIGATION DATA SUMMARY REPORT
FORMER GREEN BAY MANUFACTURED GAS PLANT
WISCONSIN PUBLIC SERVICE CORPORATION
GREEN BAY, WISCONSIN

FIGURE 24

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

APPENDIX 1
NAPL IN FRACTURES DOCUMENTATION

11/2/15

1584 – Green Bay Former MGP

2015 Remedial Investigation Clay Characterization

Staff: Brian Hennings and Andrew Cawrse

Objective: Supplemental characterization of clay samples collected from the former MGP Site. Describe clay samples with Non-Aqueous Phase Liquid (NAPL) and clay without NAPL. Samples were collected from soil boring SB-418E using direct push sampling methods during RI work completed between October 19 and October 20, 2015. Samples of clay were placed in baggies and returned to the NRT warehouse for documentation. Following documentation, the remaining sample was returned to the Green Bay former MGP site and placed in the soil drums for disposal with the rest of the investigative derived soil generated during upland RI activities.

Description of clay with NAPL in fractures:

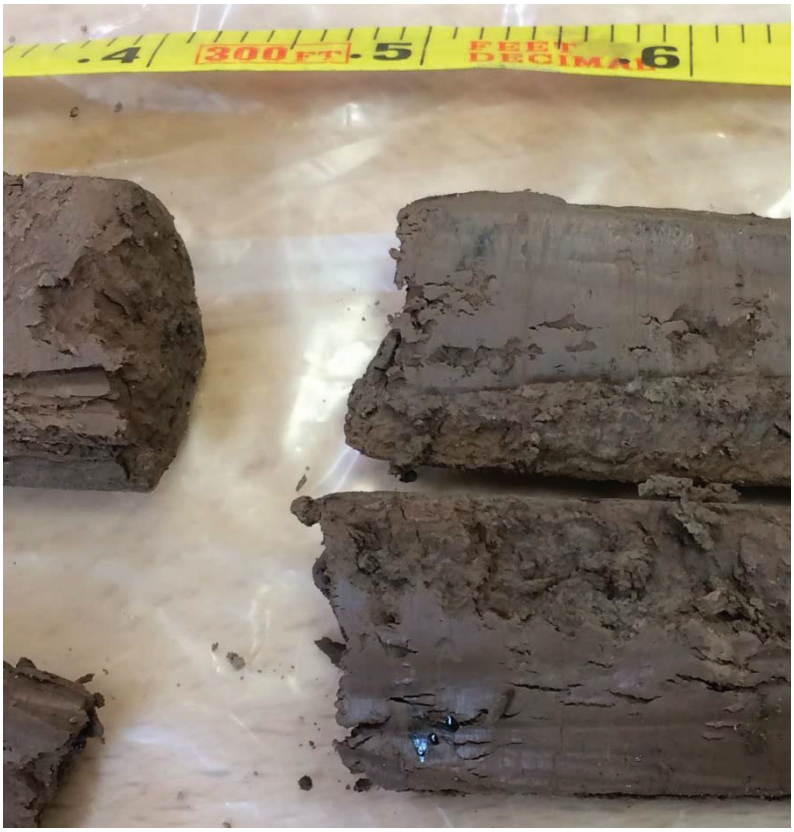
Thin vertical to near vertical fractures present in the clay ranged in length from 0.1 to 0.3 feet and were less than 1 millimeter (mm) wide. Fractures may occur as a single through-going fracture or cluster of overlapping and intersecting fractures. No horizontal fractures were observed in the clay.

Oil-wetted material (black NAPL) was observed within and coating the sides of fractures. The NAPL observed ranged from:

a. Dry and hard with a shiny black luster that does not transfer to gloves (picture below)

b. Viscous tar-like NAPL that pulls apart in strands like taffy when you break it open.

c. Very fine oil droplets (less than 1 mm in diameter) that rise out of a fracture that can transfer to gloves staining them black and brown (pictured below)



All three occurrences of NAPL were accompanied by mothball-like odors.

Though the fractures containing NAPL can be relatively long, they are very thin and comprise a relatively small amount of the total core volume, visually estimated to be less than 5% (trace amounts), see picture below.

Description of clay without NAPL in fractures:

The matrix of the clay without NAPL observations appears the same as the clay above. Fractures are difficult to identify; however, it appears that fine gray silt fills some fractures in a similar fashion to how NAPL occurs within fractures above. No odors or visual observations of NAPL were observed in lower clay.

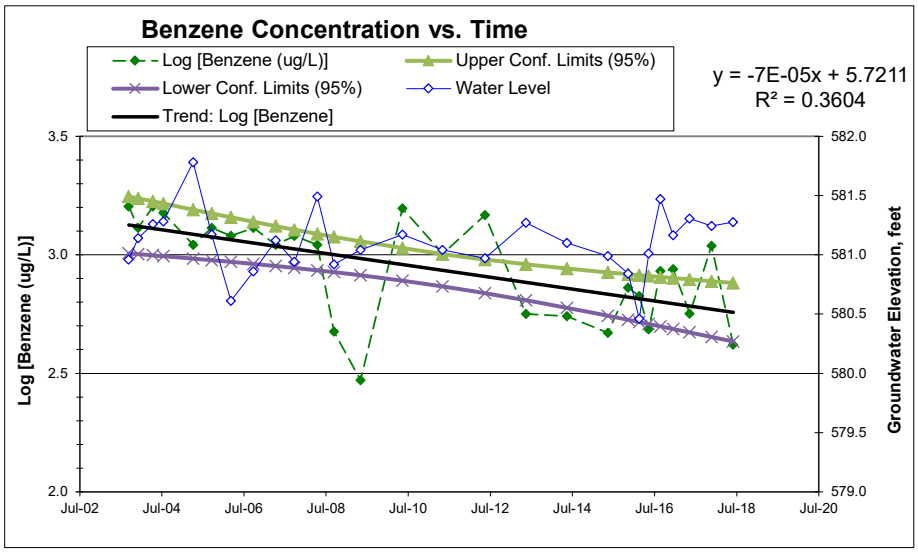
Signatures: Brian Hennings Digitally signed by Brian Hennings DN: cn=Brian Hennings, o=NRT, ou, email=bhennings@naturalrt.com, c=US Date: 2015.11.04 16:32:45 -06'00'

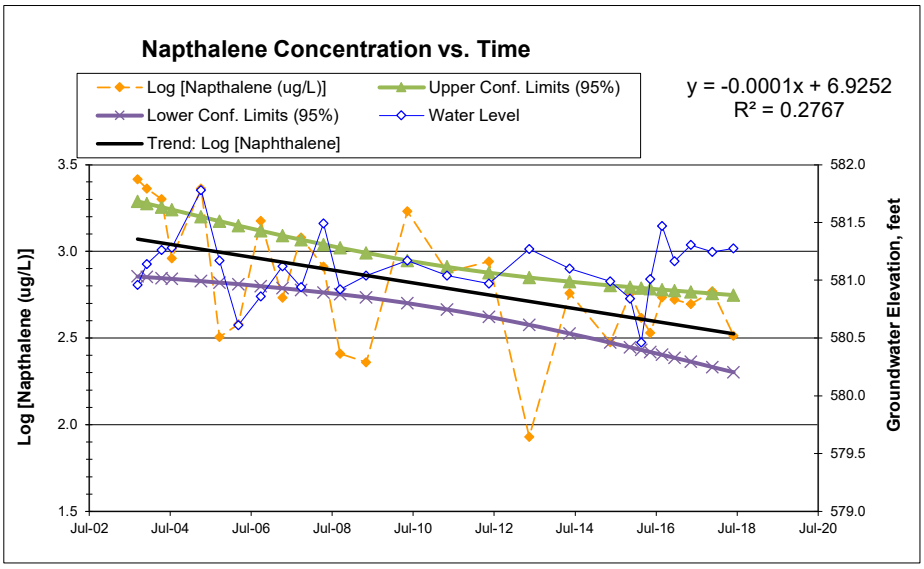
Andrew Cawrse Digitally signed by Andrew Cawrse DN: cn=Andrew Cawrse, o, ou, email=acawrse@naturalrt.com, c=US Date: 2015.11.05 07:47:08 -06'00'

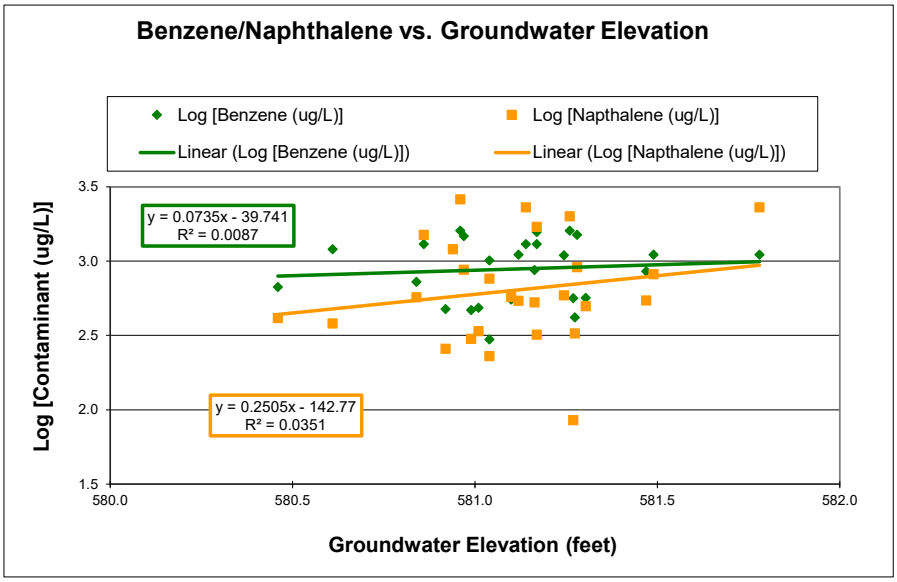
APPENDIX 2
GROUNDWATER TREND PLOTS

MW-402R

Former Green Bay MGP Site - Wisconsin Public Service Corporation

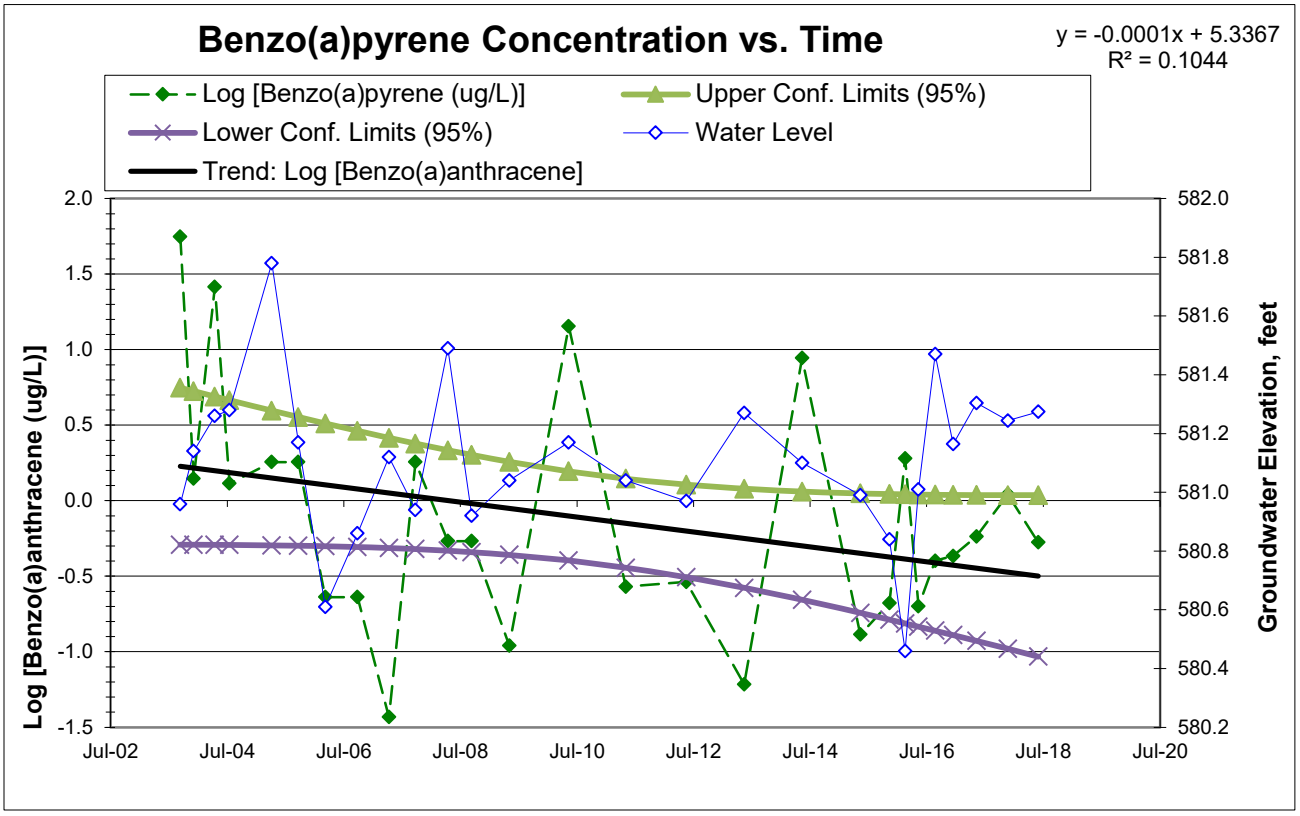


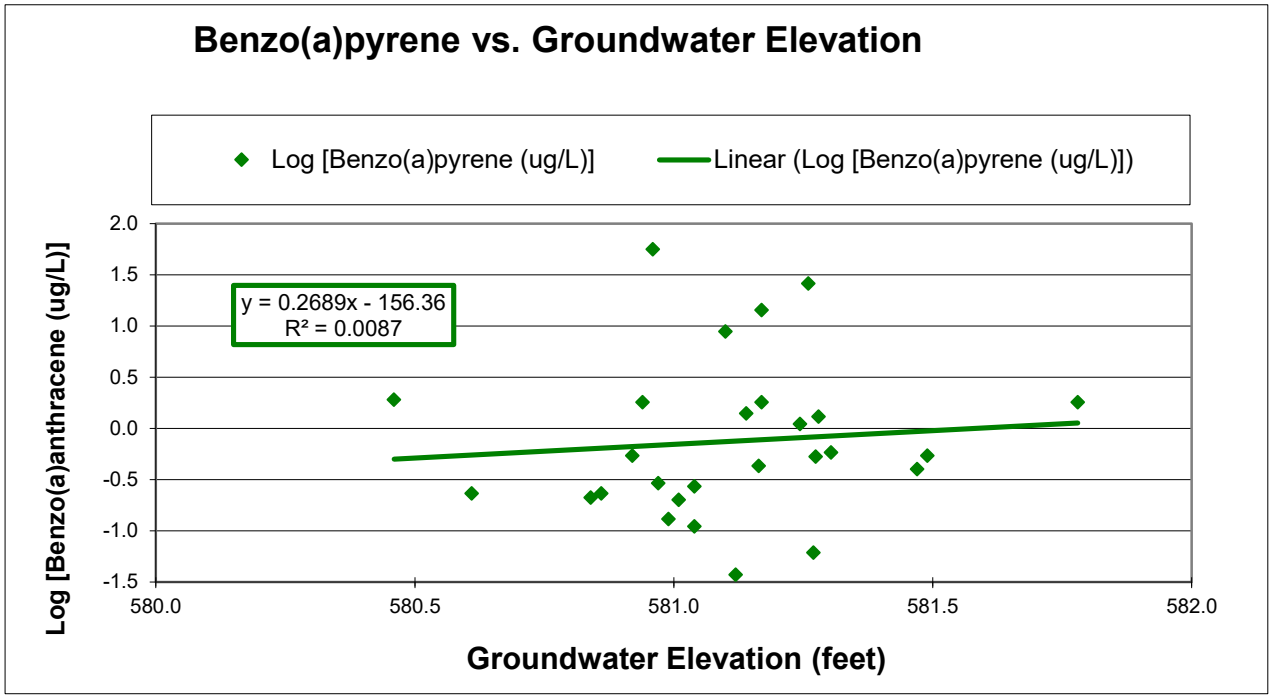




MW-402R

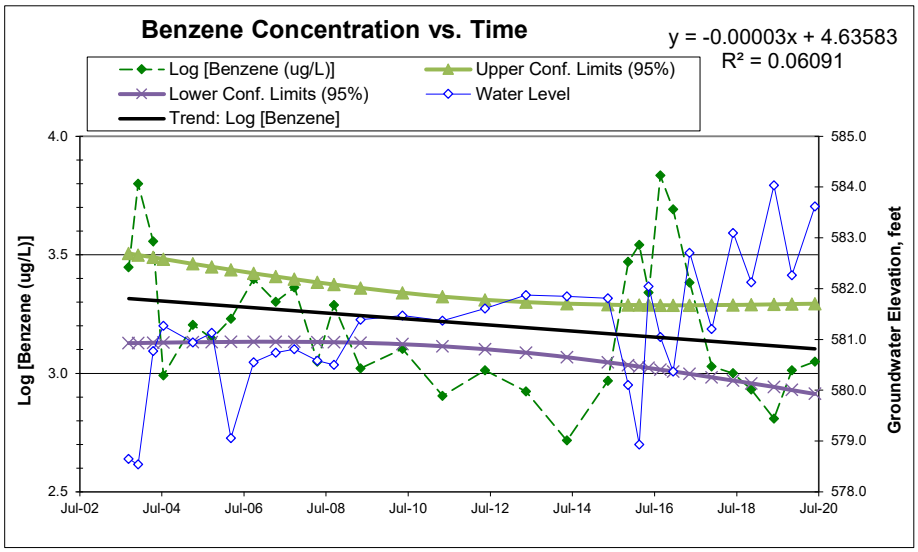
Former Green Bay MGP Site - Wisconsin Public Service Corporation

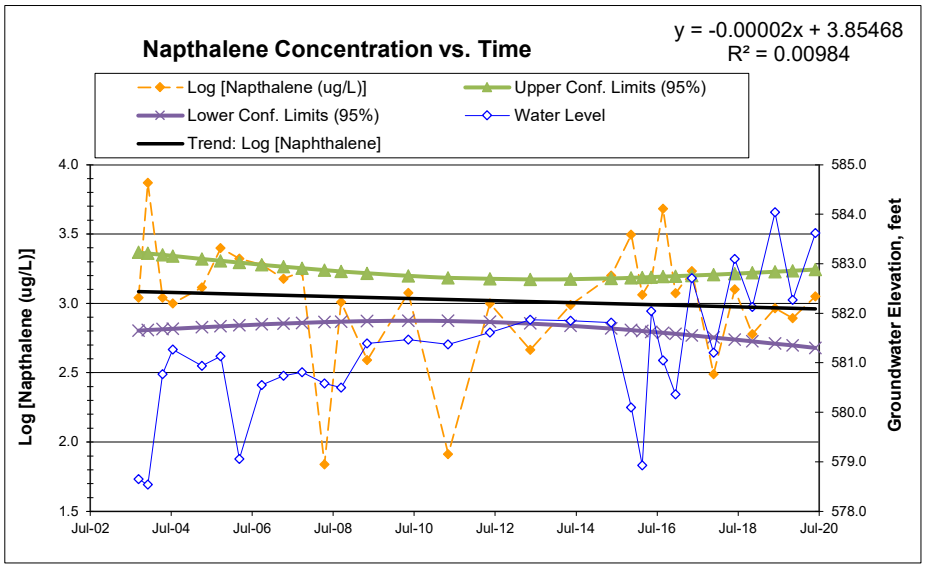


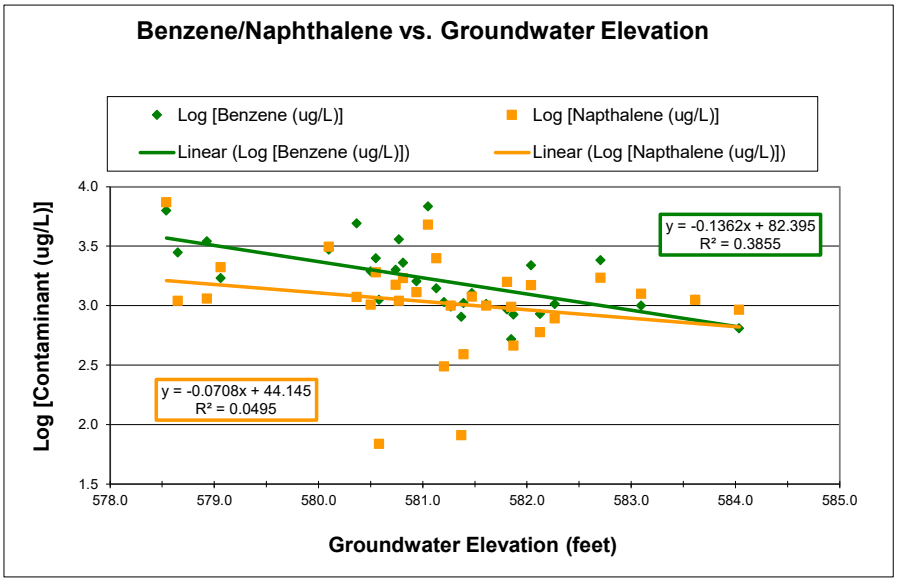


MW-403R

Former Green Bay MGP Site - Wisconsin Public Service Corporation

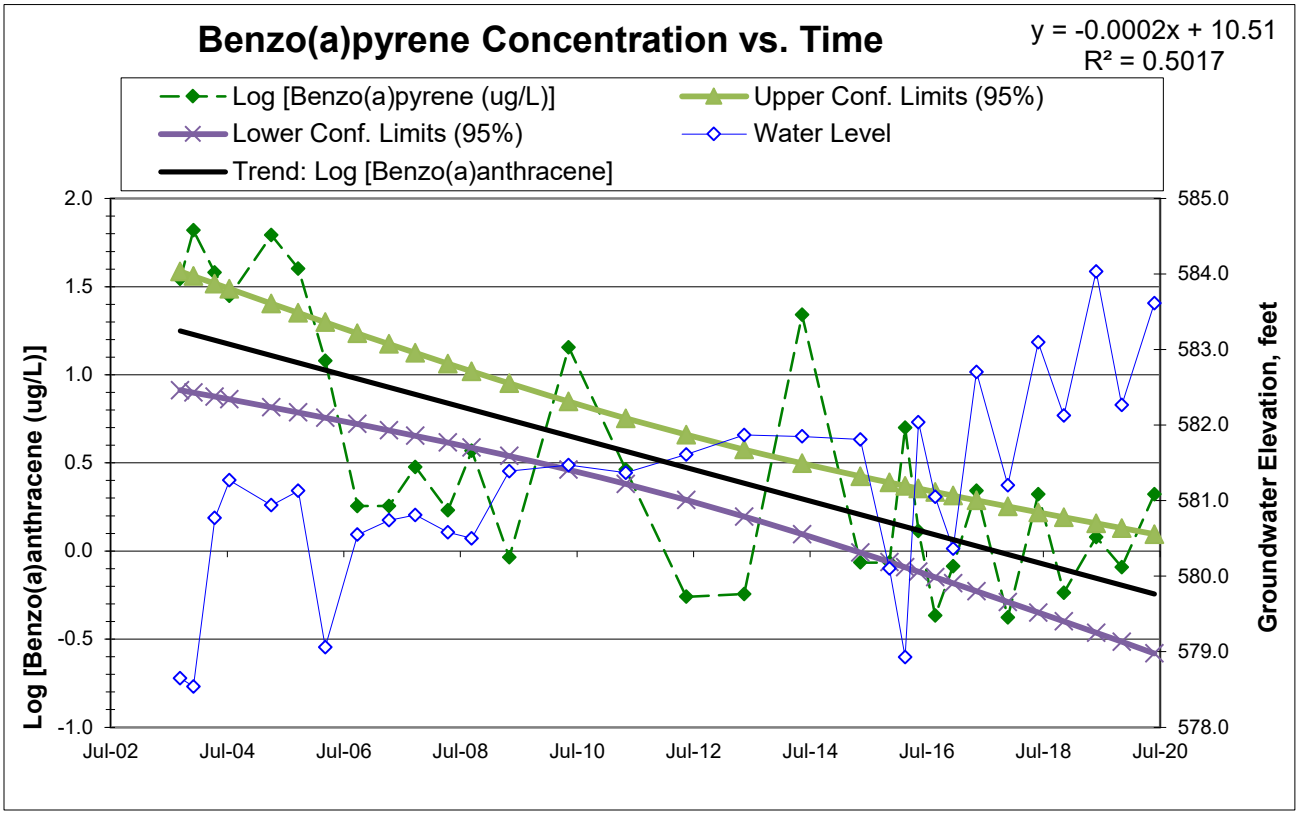


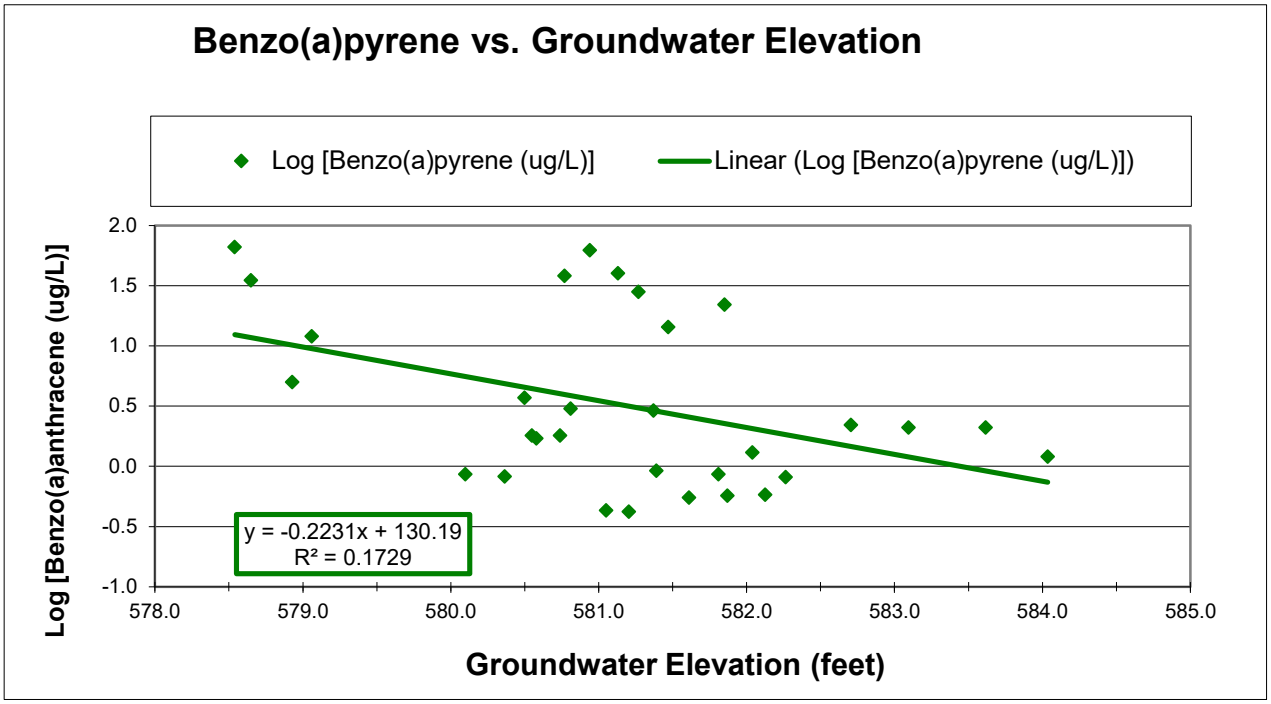




MW-403R

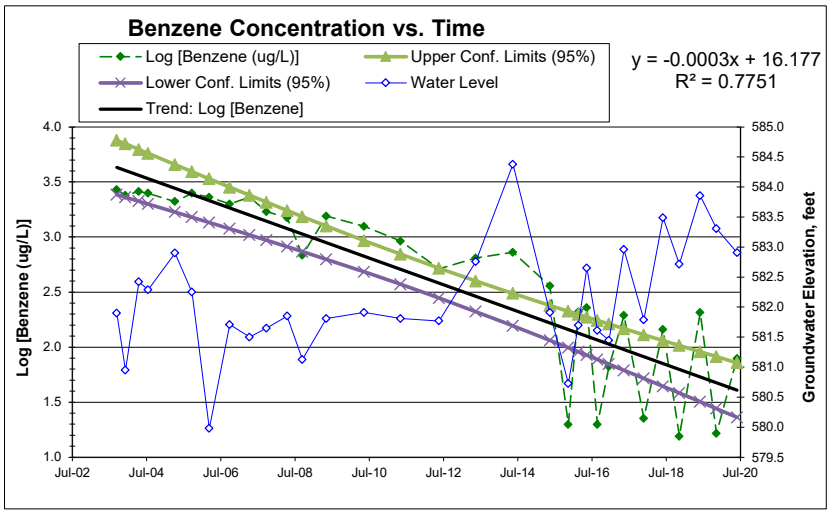
Former Green Bay MGP Site - Wisconsin Public Service Corporation

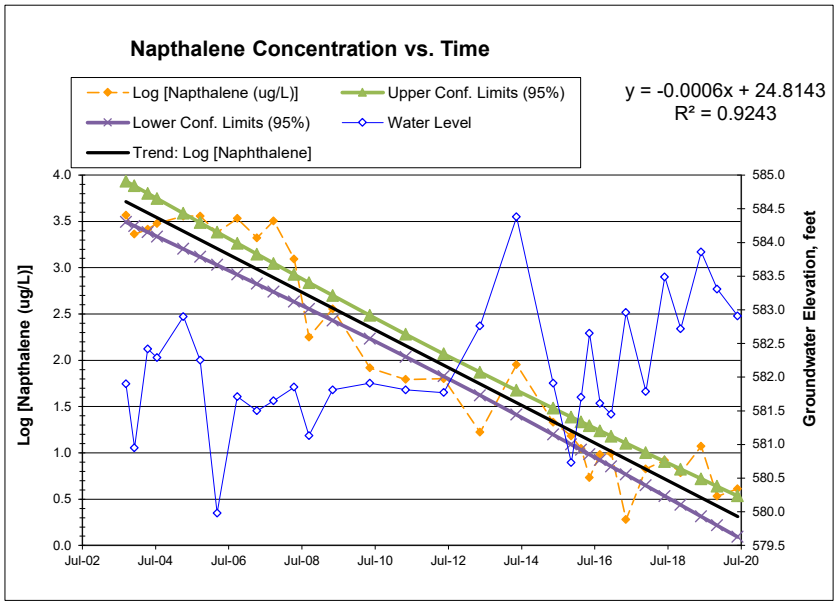


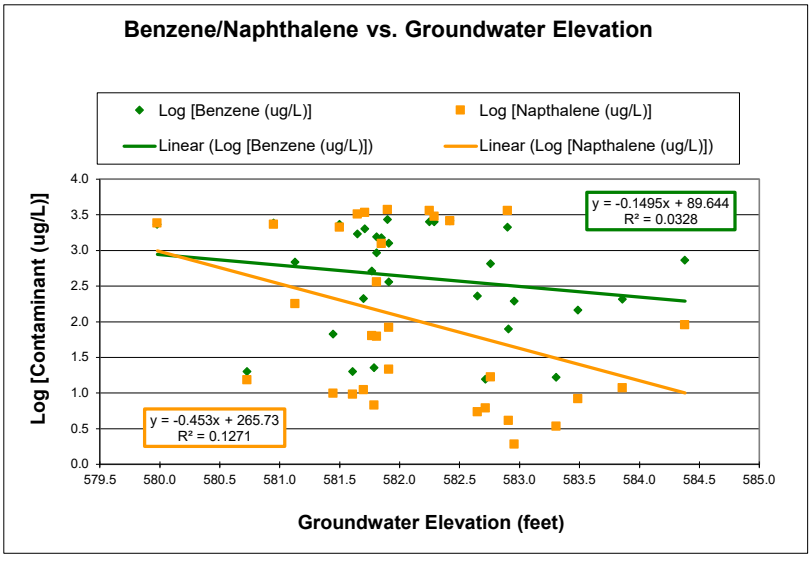


MW-404

Former Green Bay MGP Site - Wisconsin Public Service Corporation

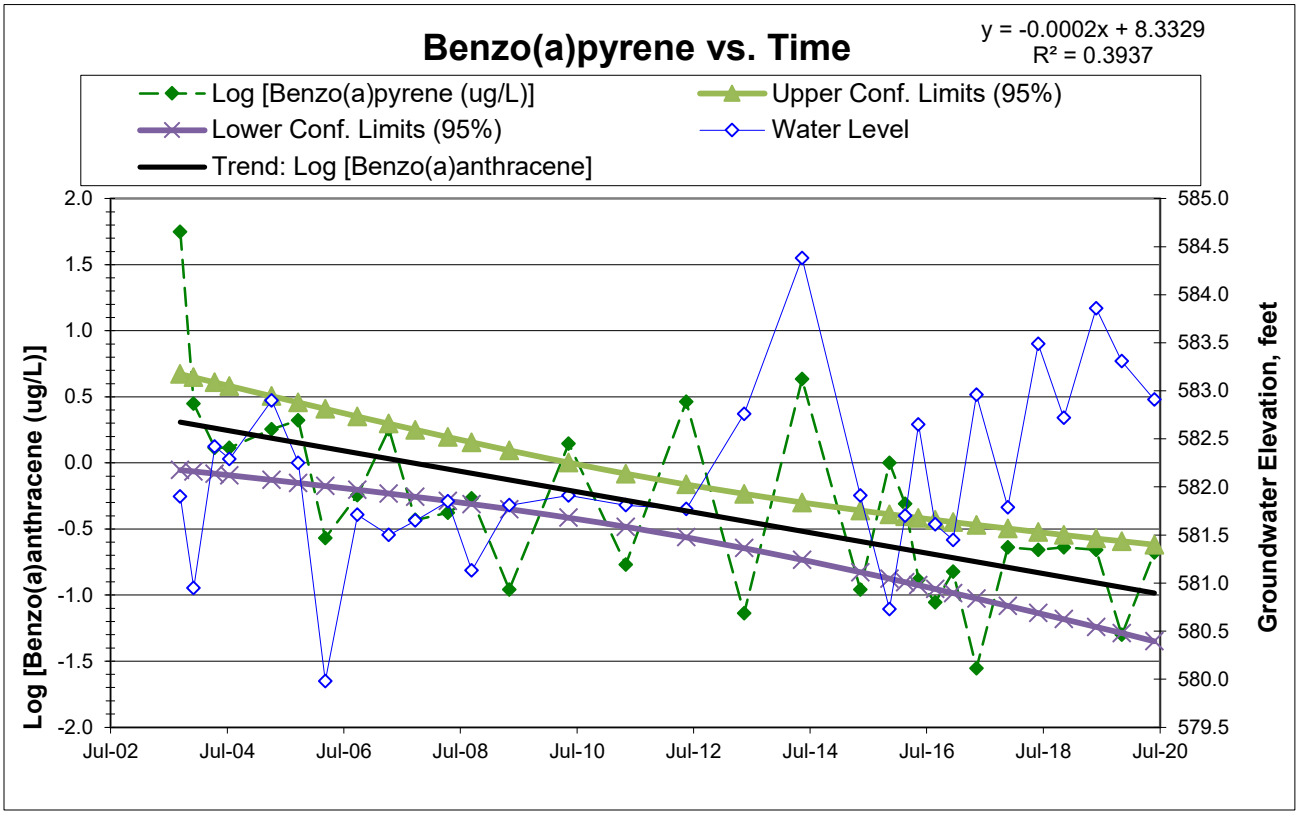


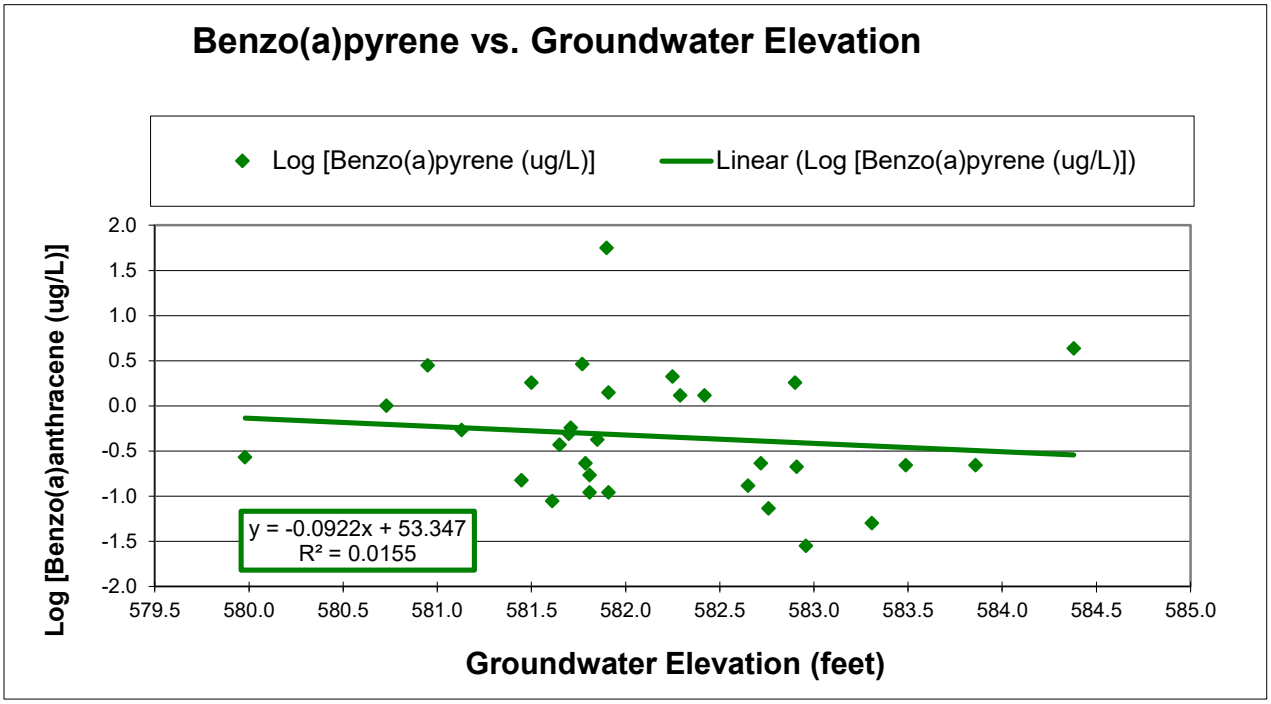




MW-404

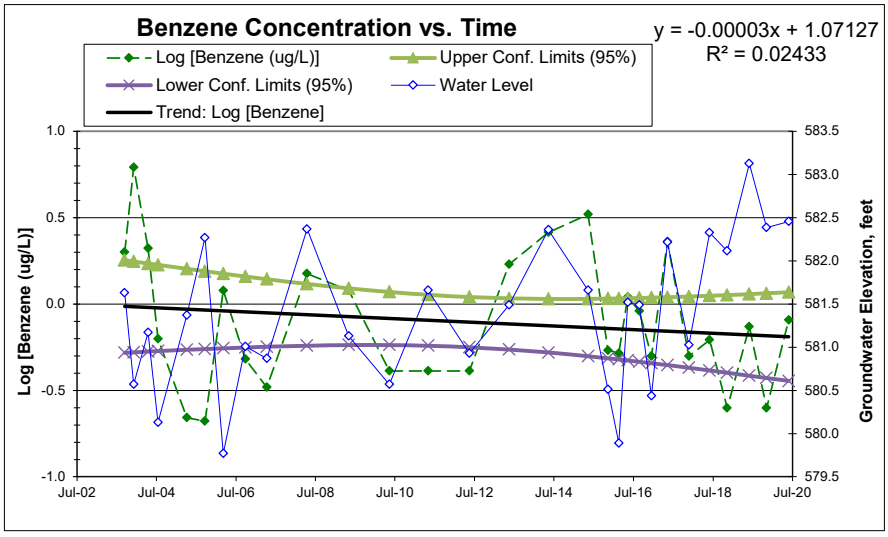
Former Green Bay MGP Site - Wisconsin Public Service Corporation

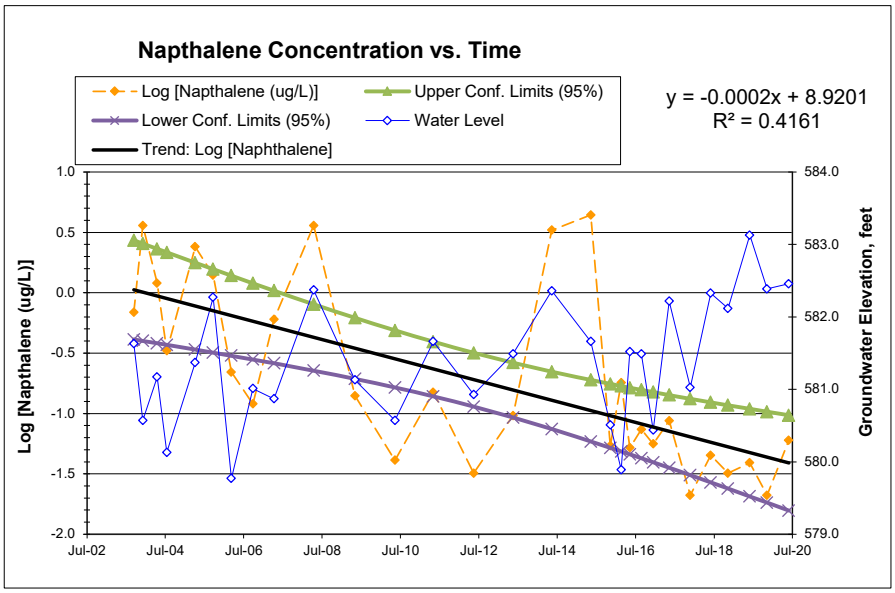


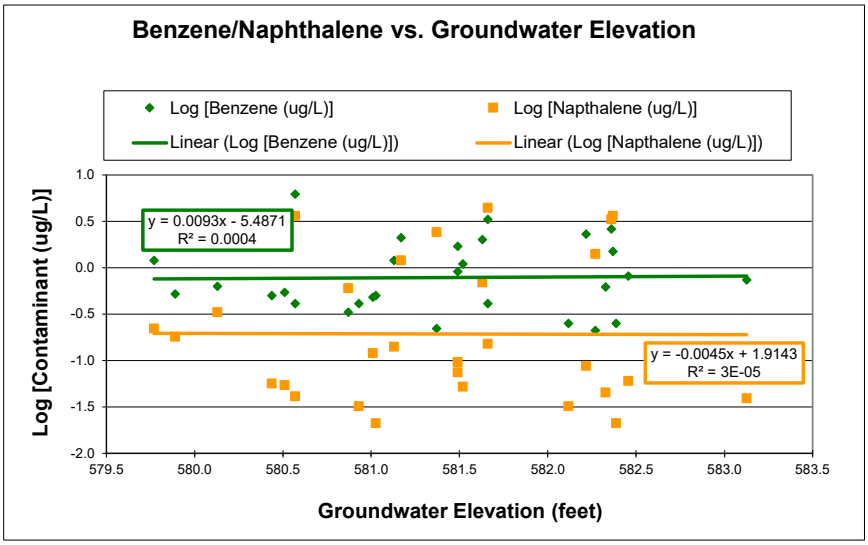


MW-406

Former Green Bay MGP Site - Wisconsin Public Service Corporation

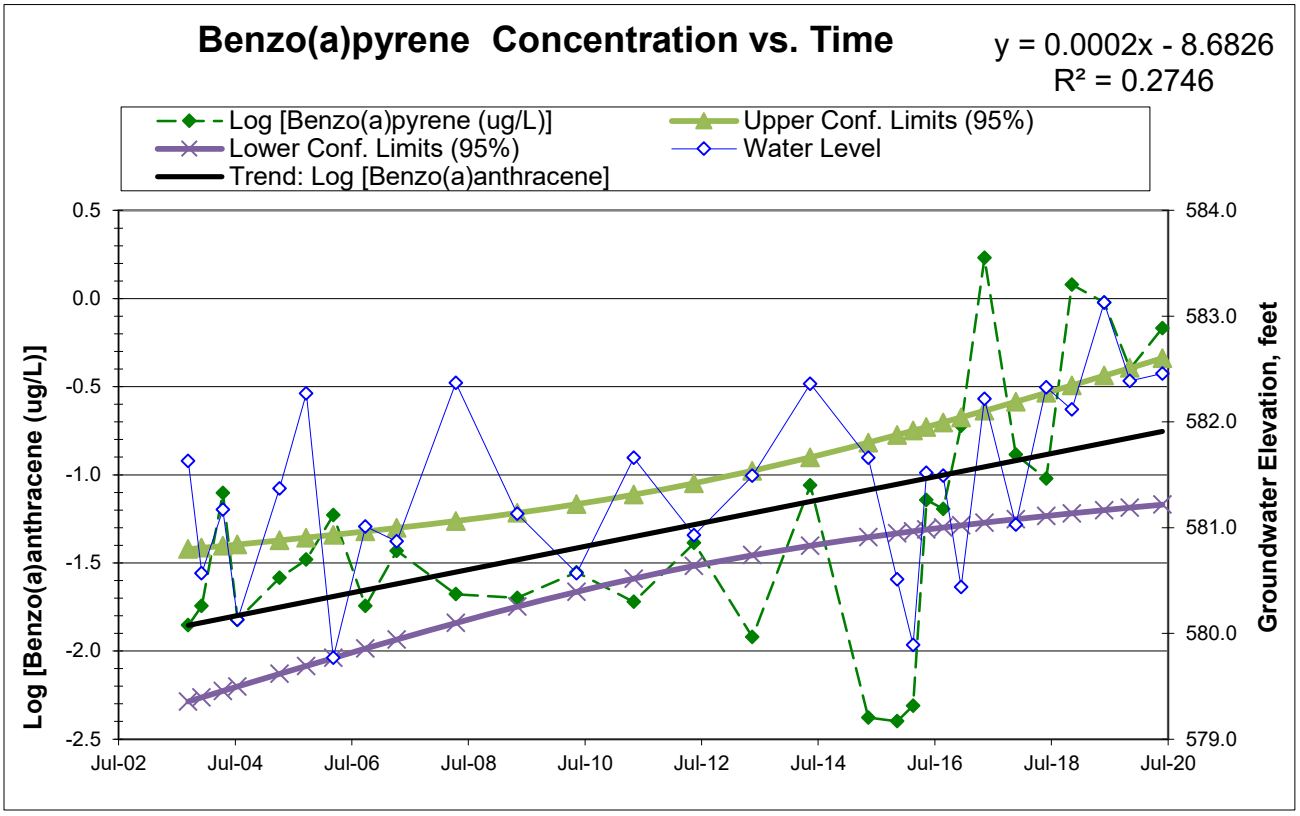


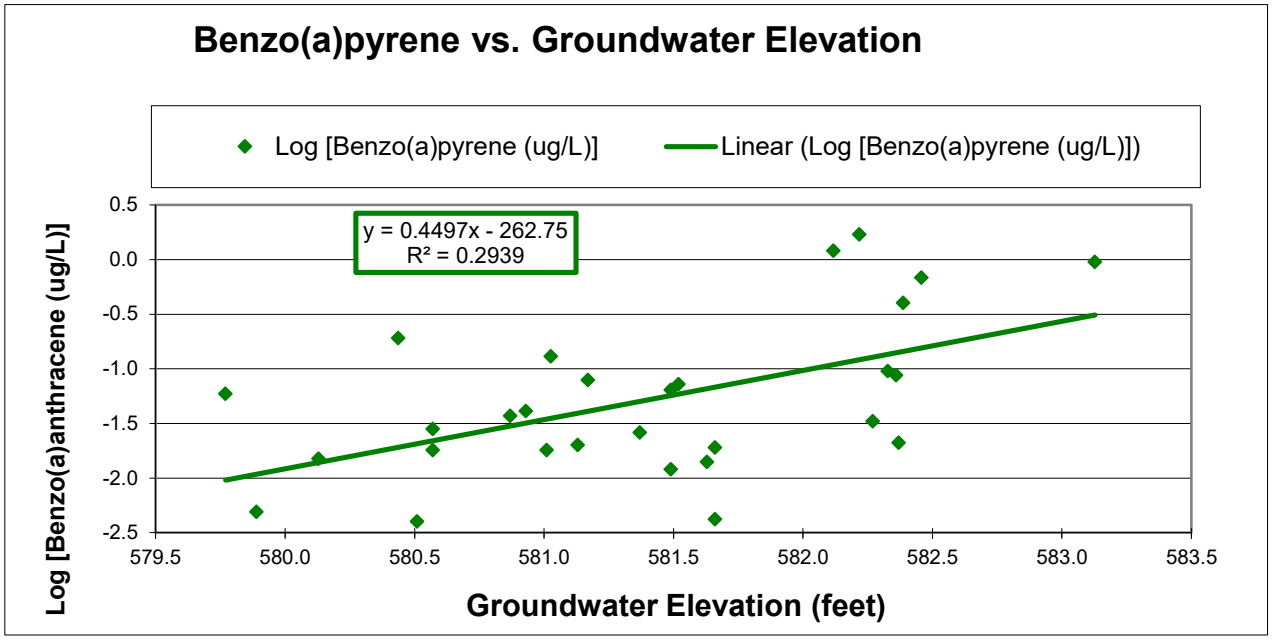




MW-406

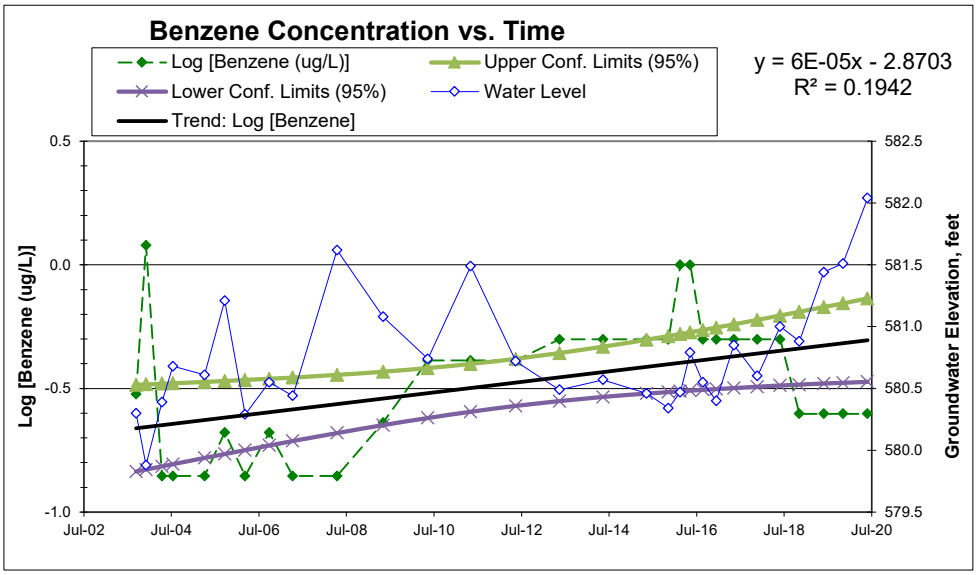
Former Green Bay MGP Site - Wisconsin Public Service Corporation

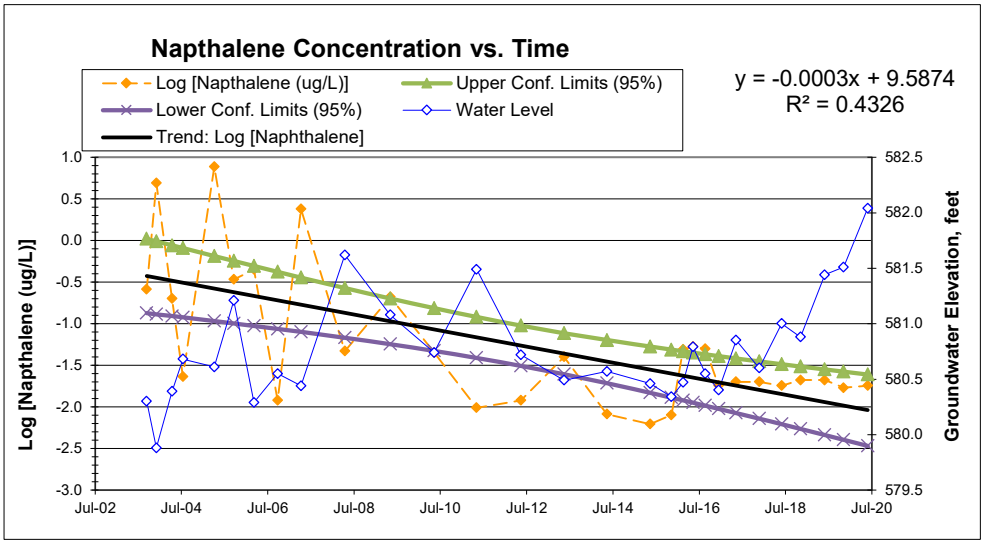


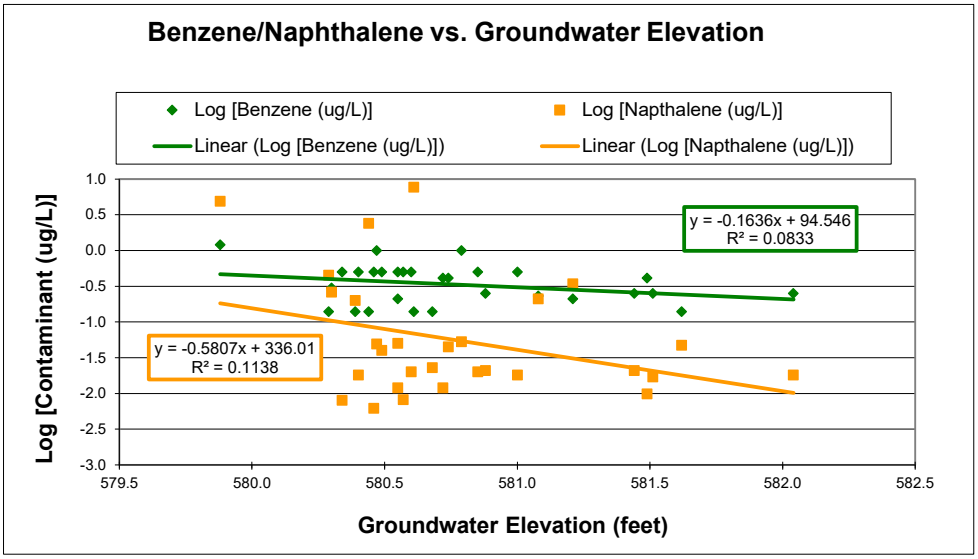


MW-407

Former Green Bay MGP Site - Wisconsin Public Service Corporation

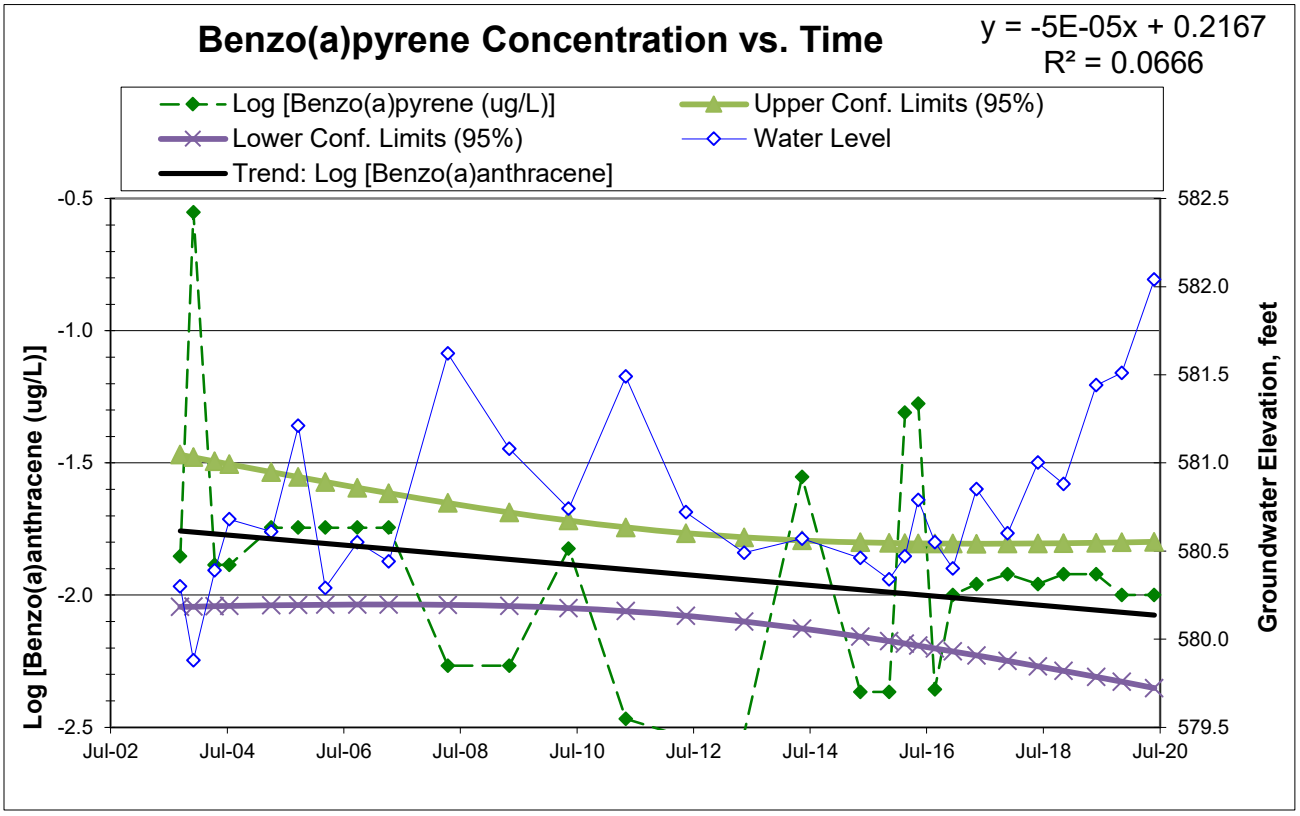


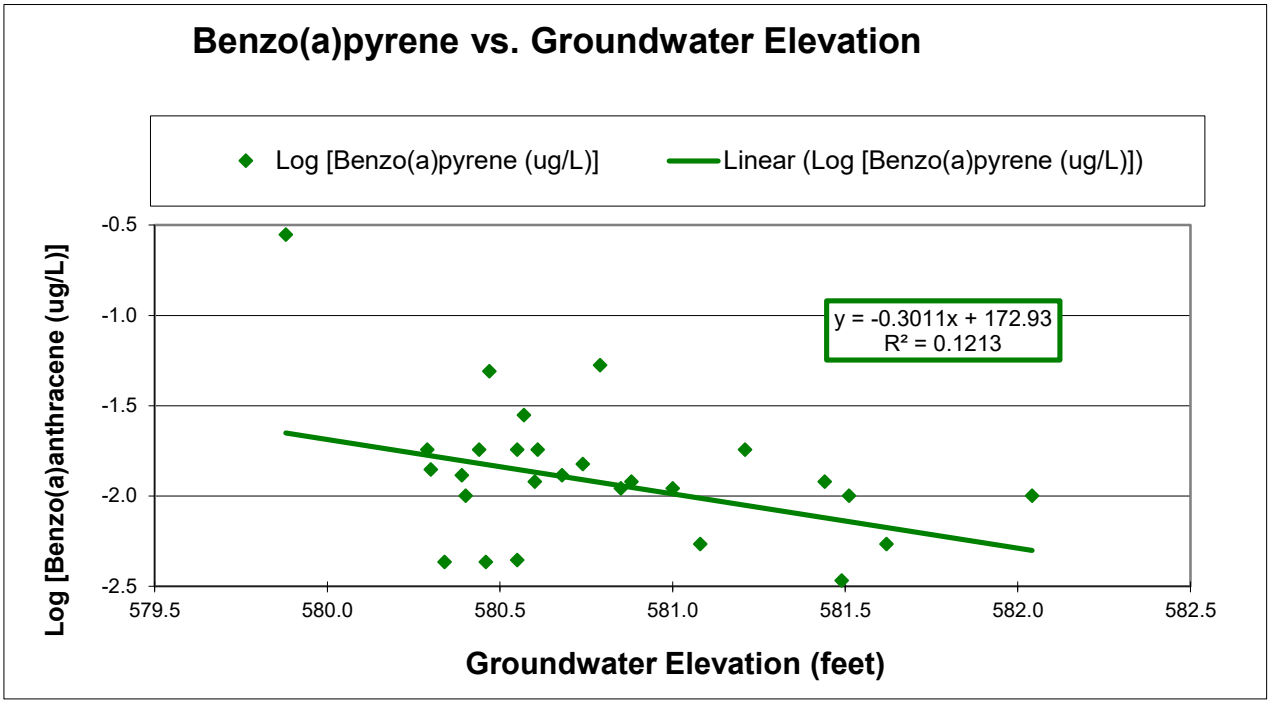




MW-407

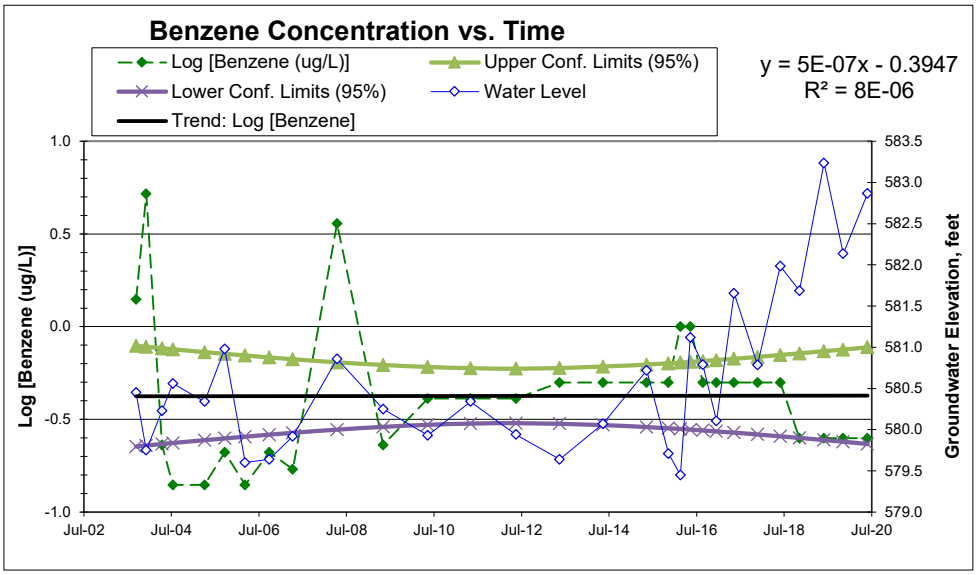
Former Green Bay MGP Site - Wisconsin Public Service Corporation

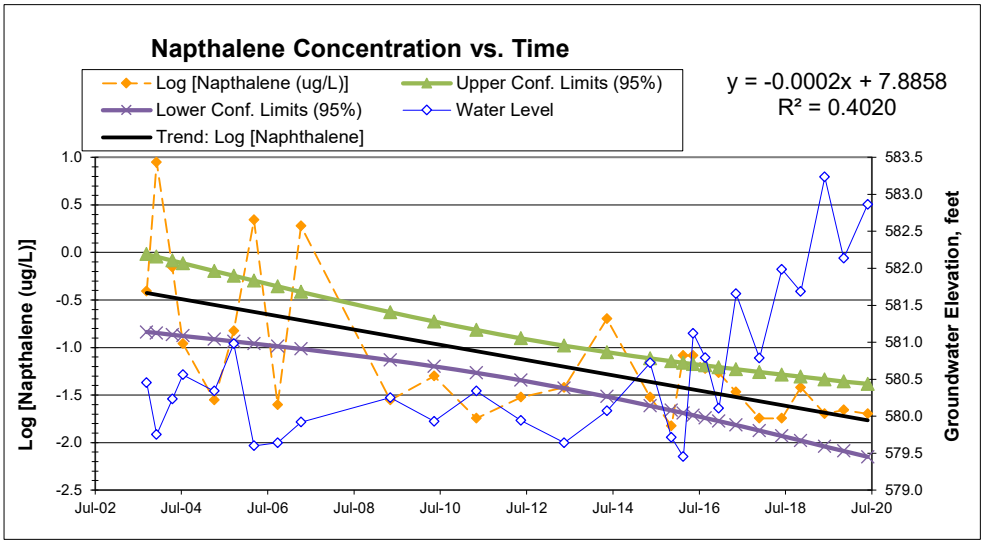


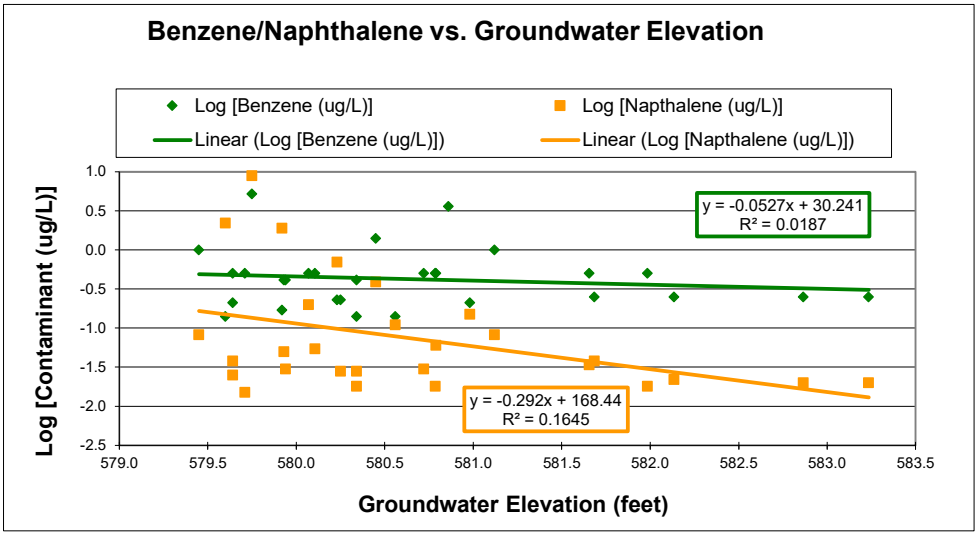


MW-408

Former Green Bay MGP Site - Wisconsin Public Service Corporation

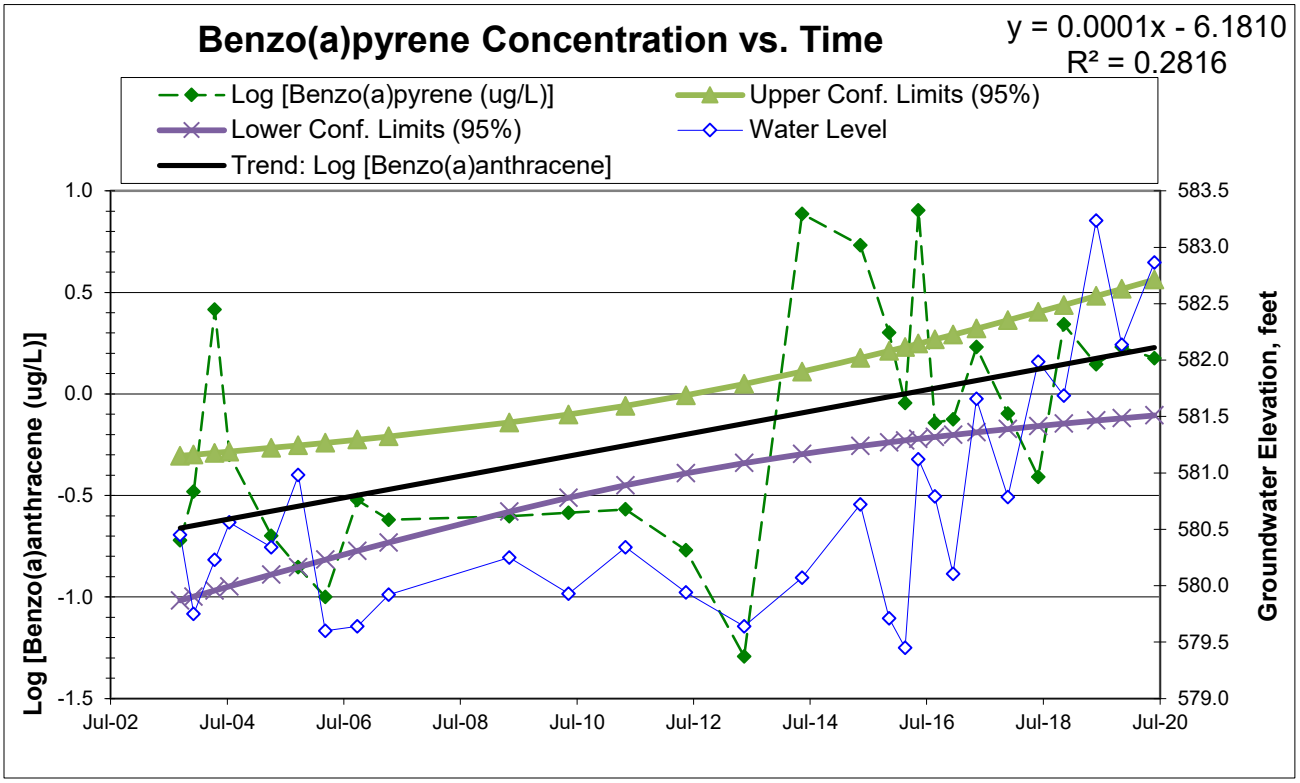


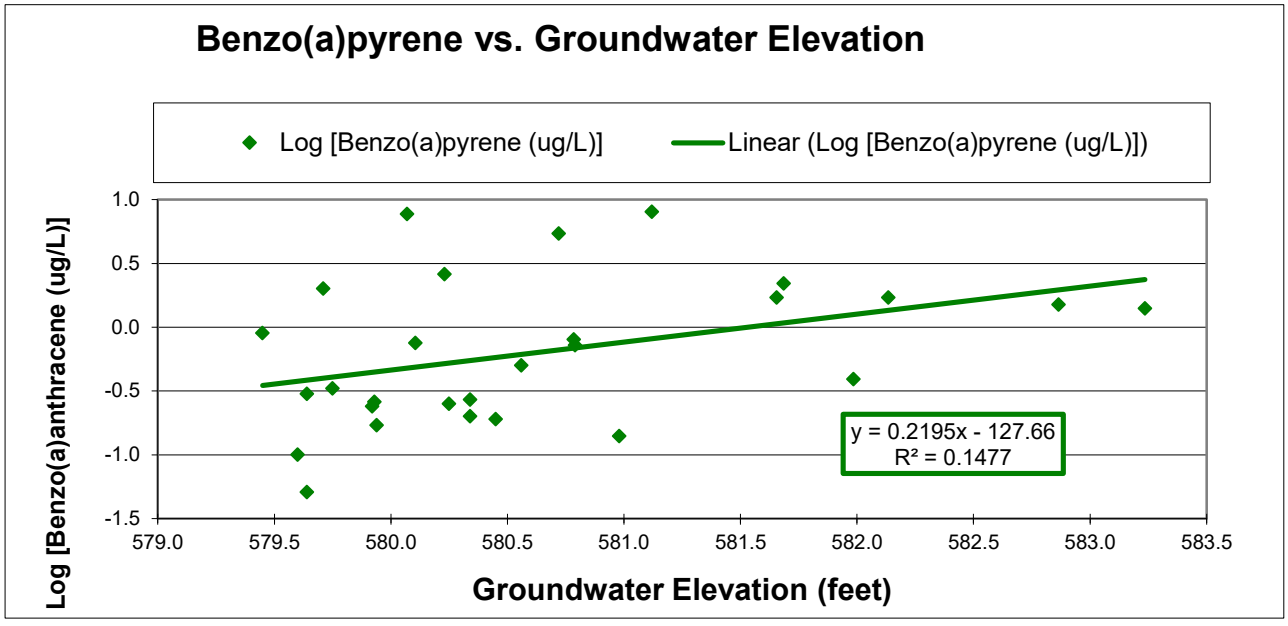




MW-408

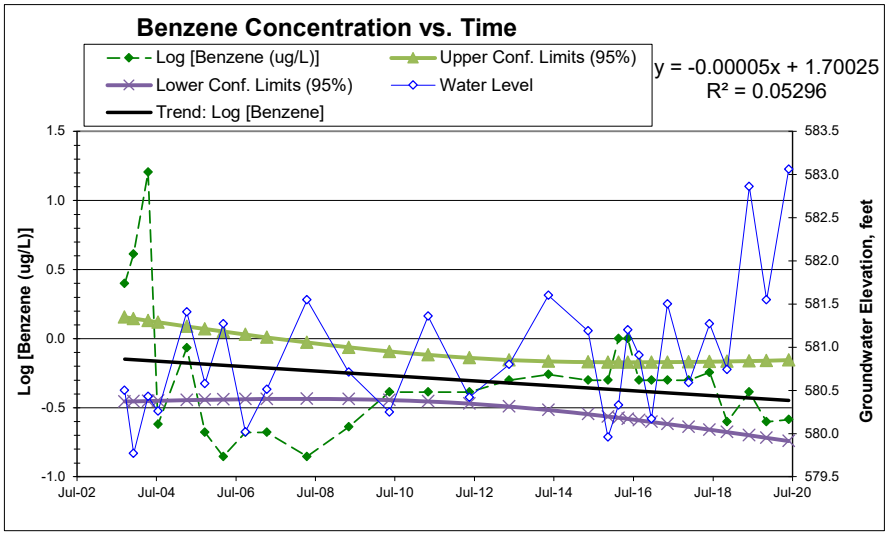
Former Green Bay MGP Site - Wisconsin Public Service Corporation

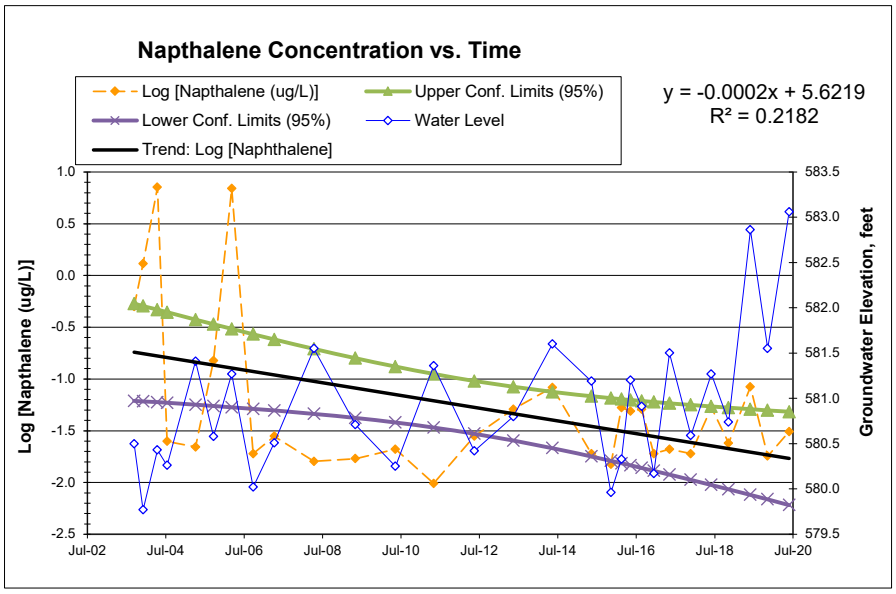


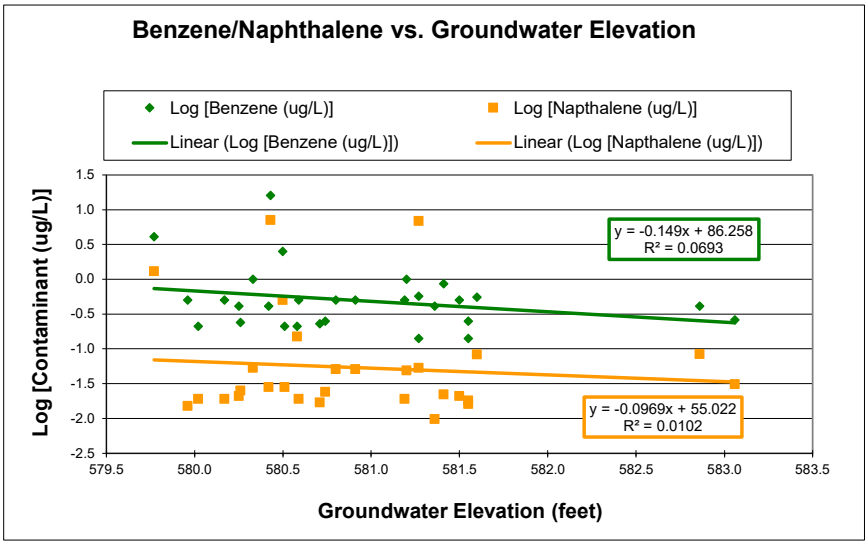


MW-409A

Former Green Bay MGP Site - Wisconsin Public Service Corporation

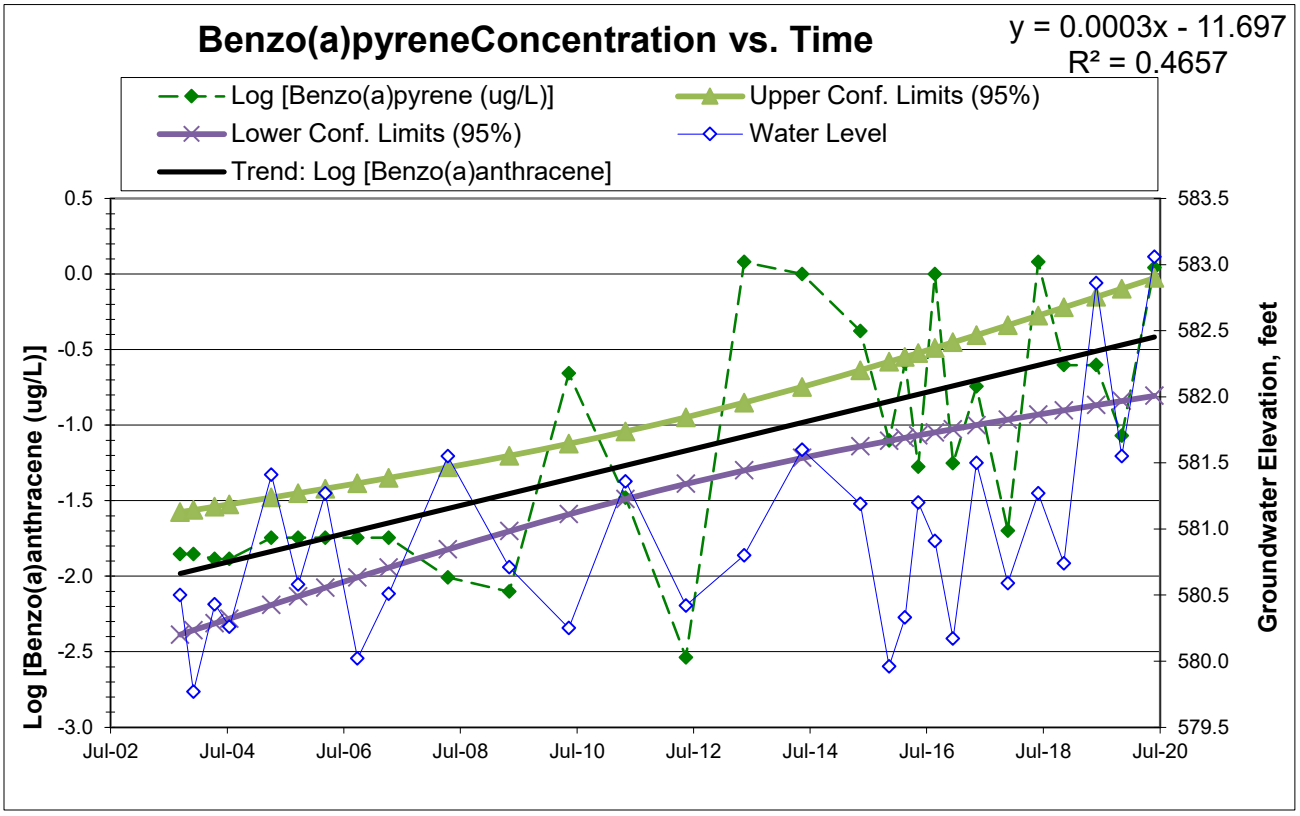


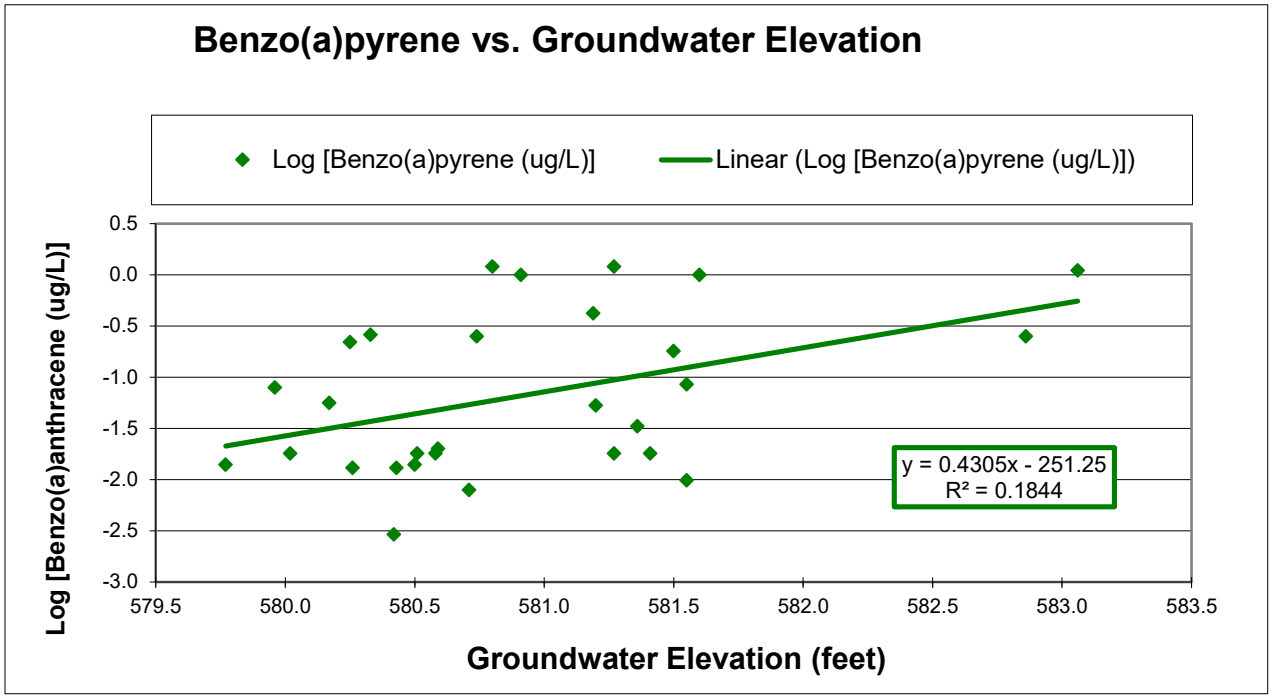




MW-409A

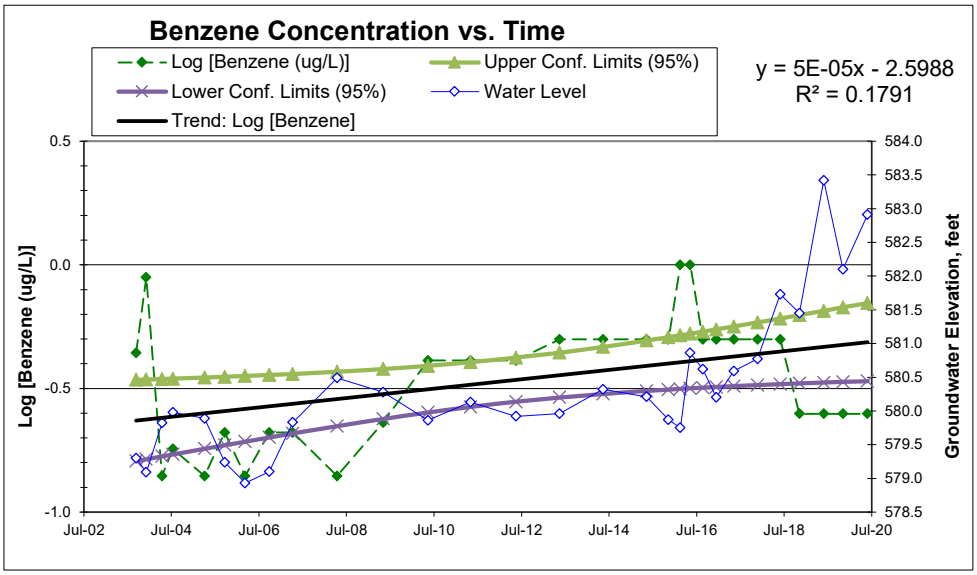
Former Green Bay MGP Site - Wisconsin Public Service Corporation

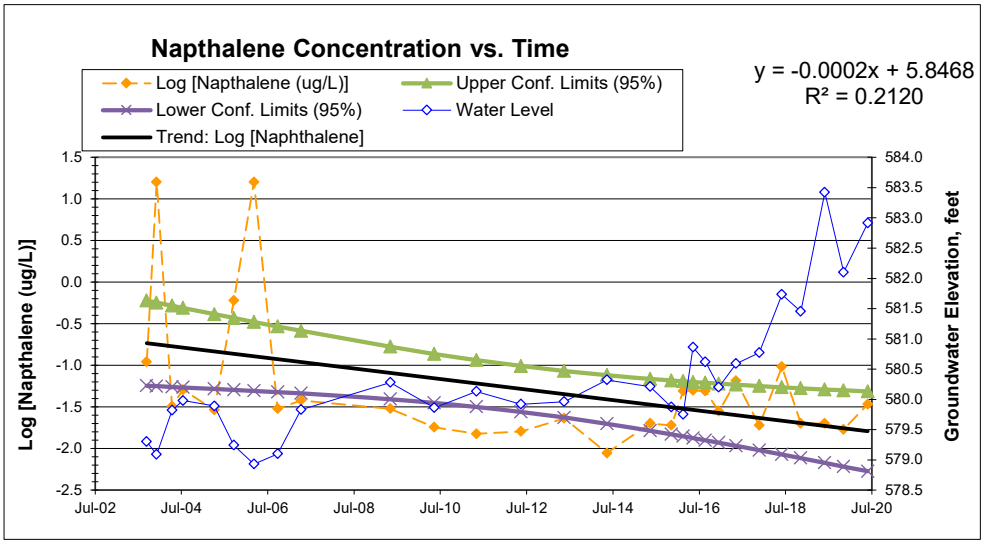


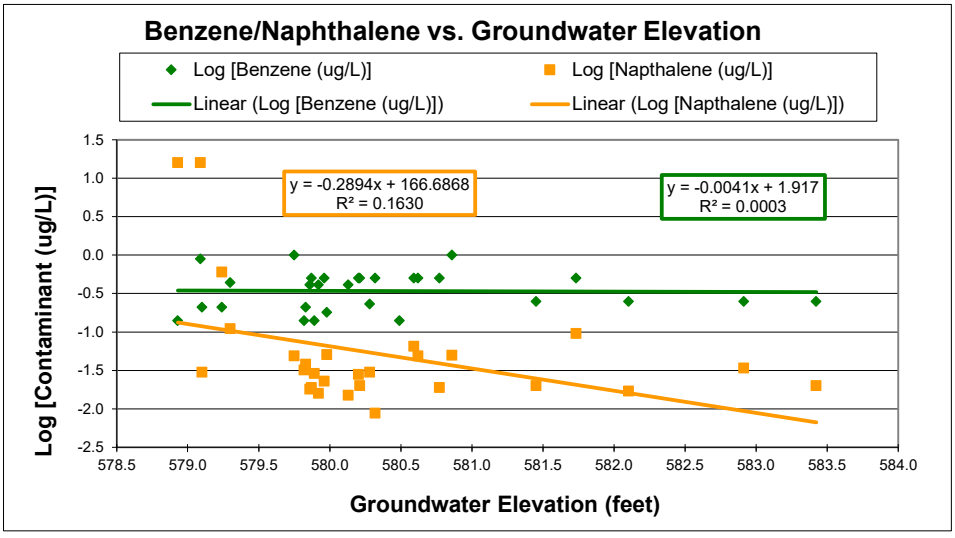


MW-410R

Former Green Bay MGP Site - Wisconsin Public Service Corporation

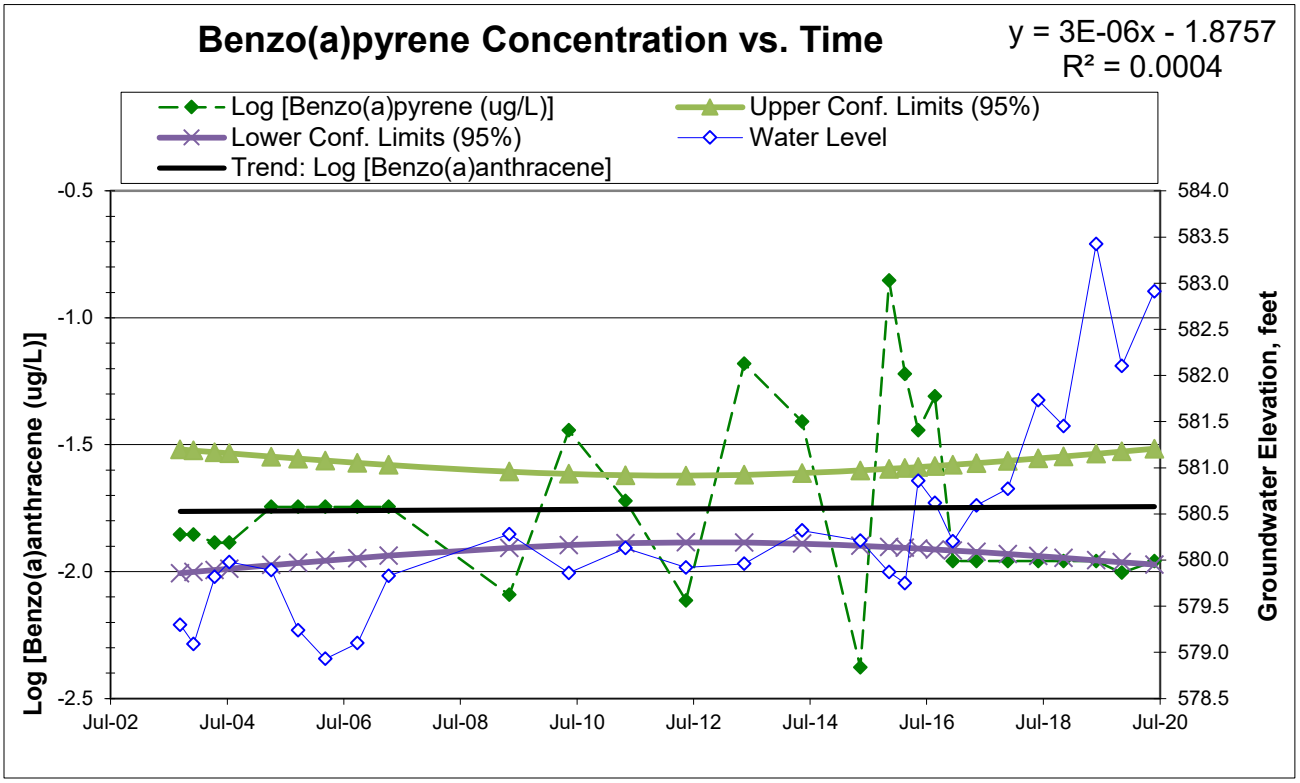


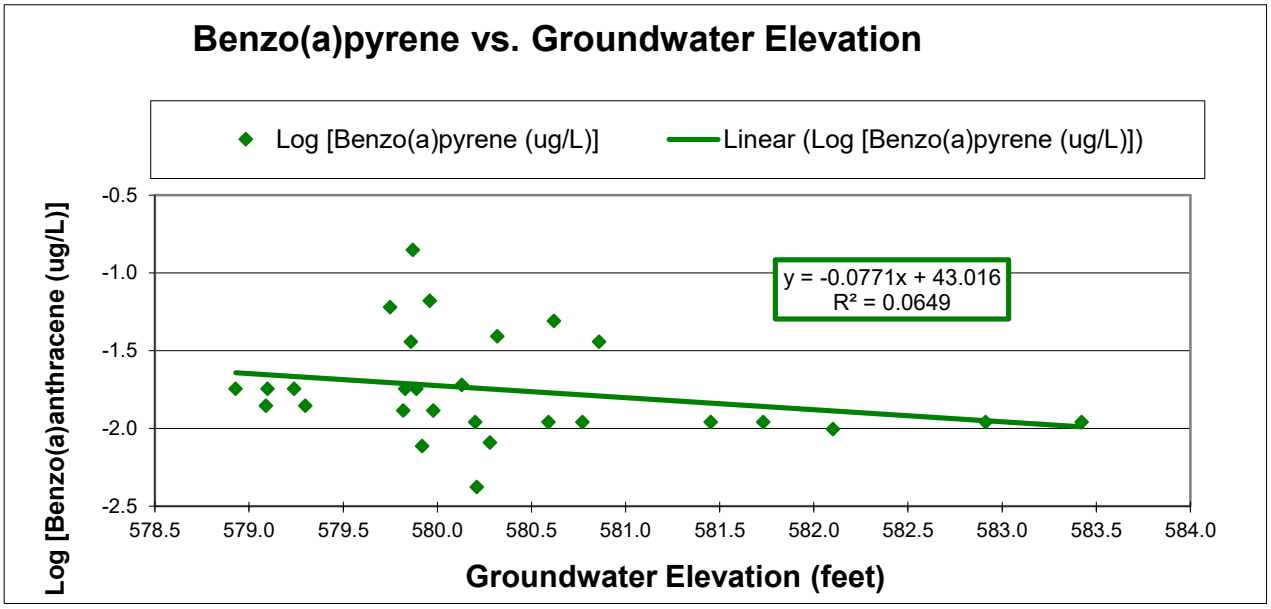




MW-410R

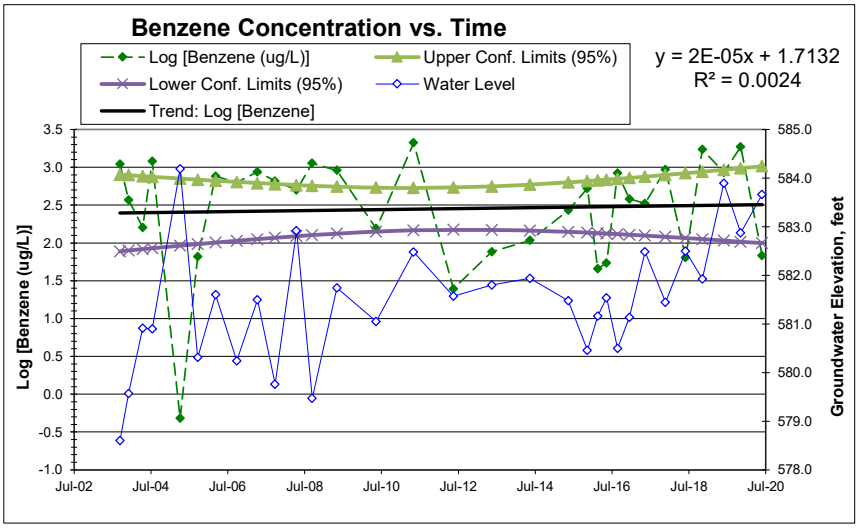
Former Green Bay MGP Site - Wisconsin Public Service Corporation

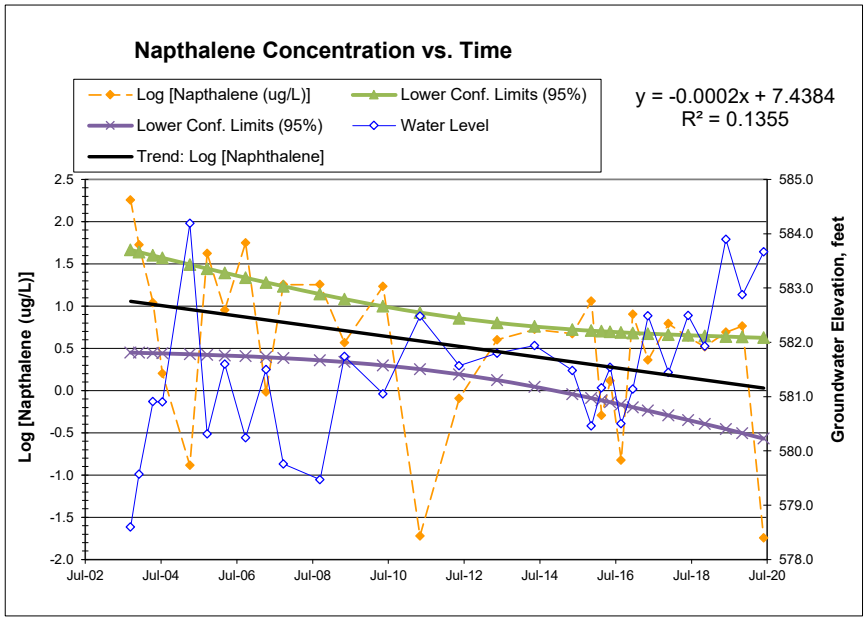


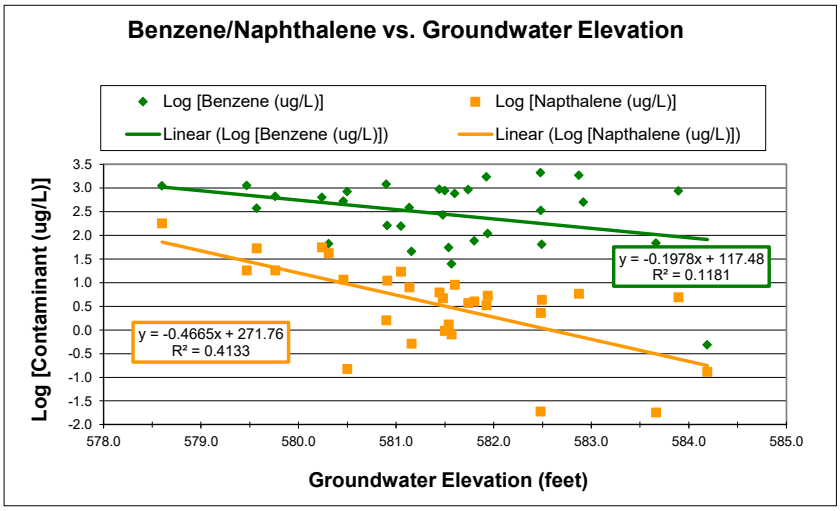


MW-411AR

Former Green Bay MGP Site - Wisconsin Public Service Corporation

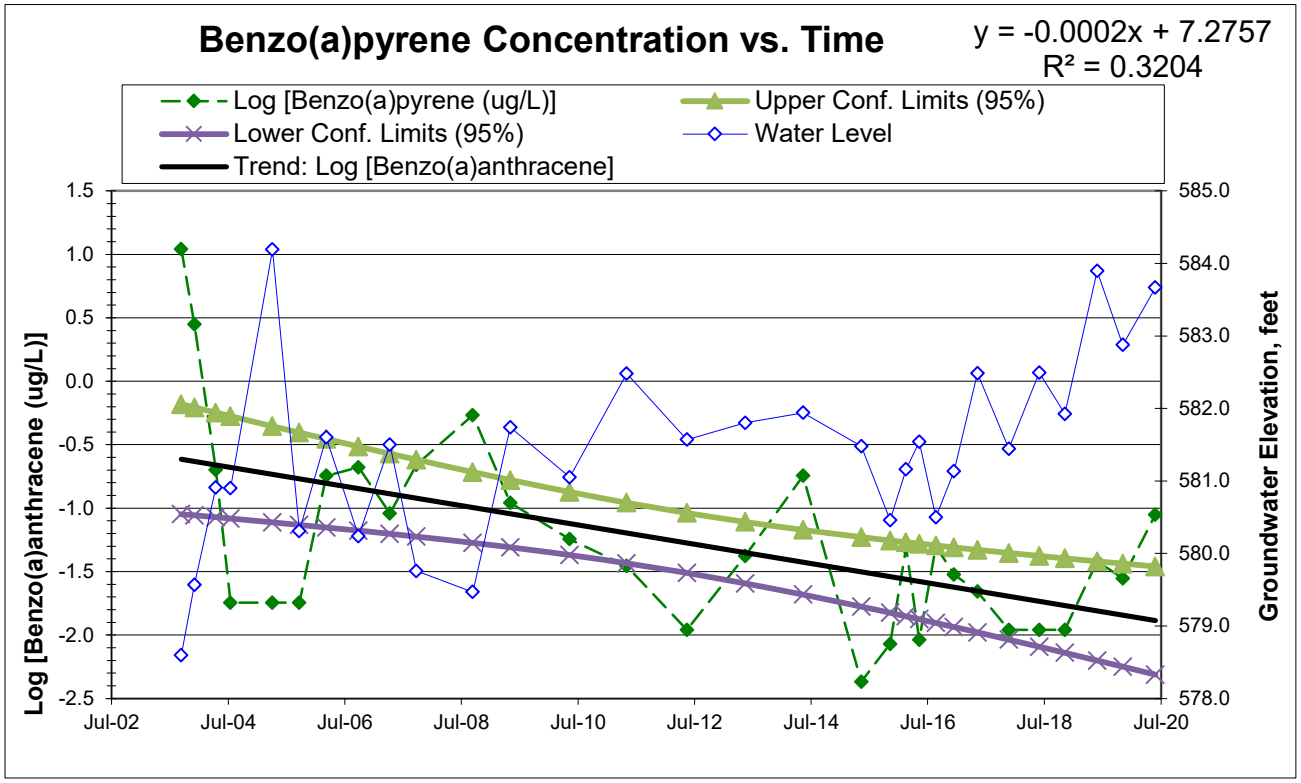


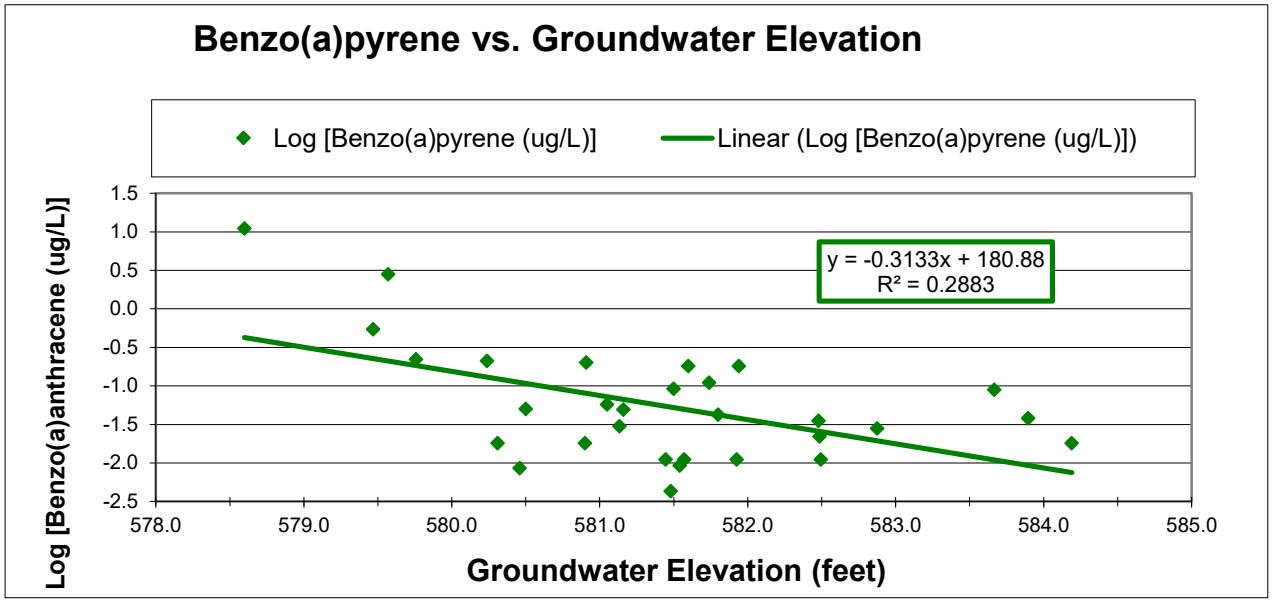




MW-411AR

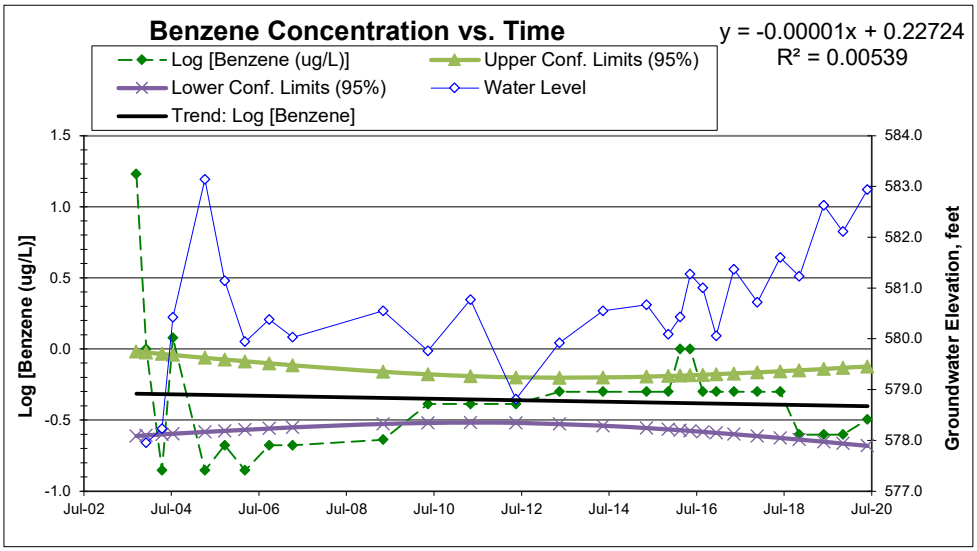
Former Green Bay MGP Site - Wisconsin Public Service Corporation

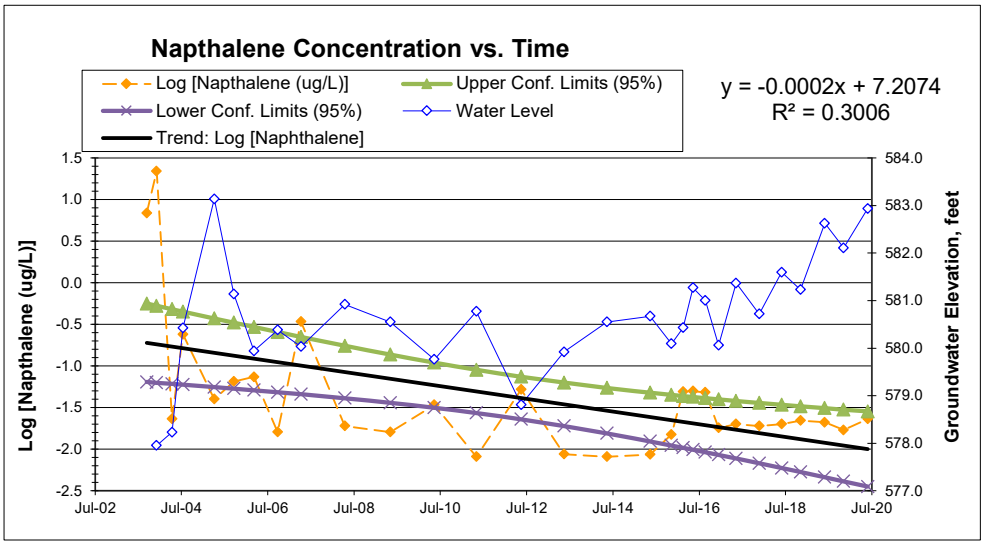


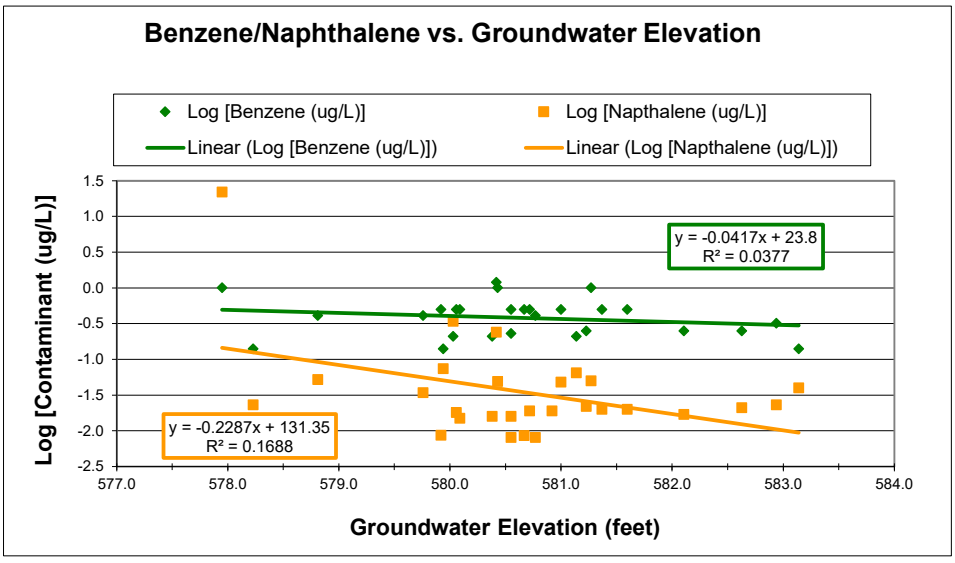


MW-412

Former Green Bay MGP Site - Wisconsin Public Service Corporation

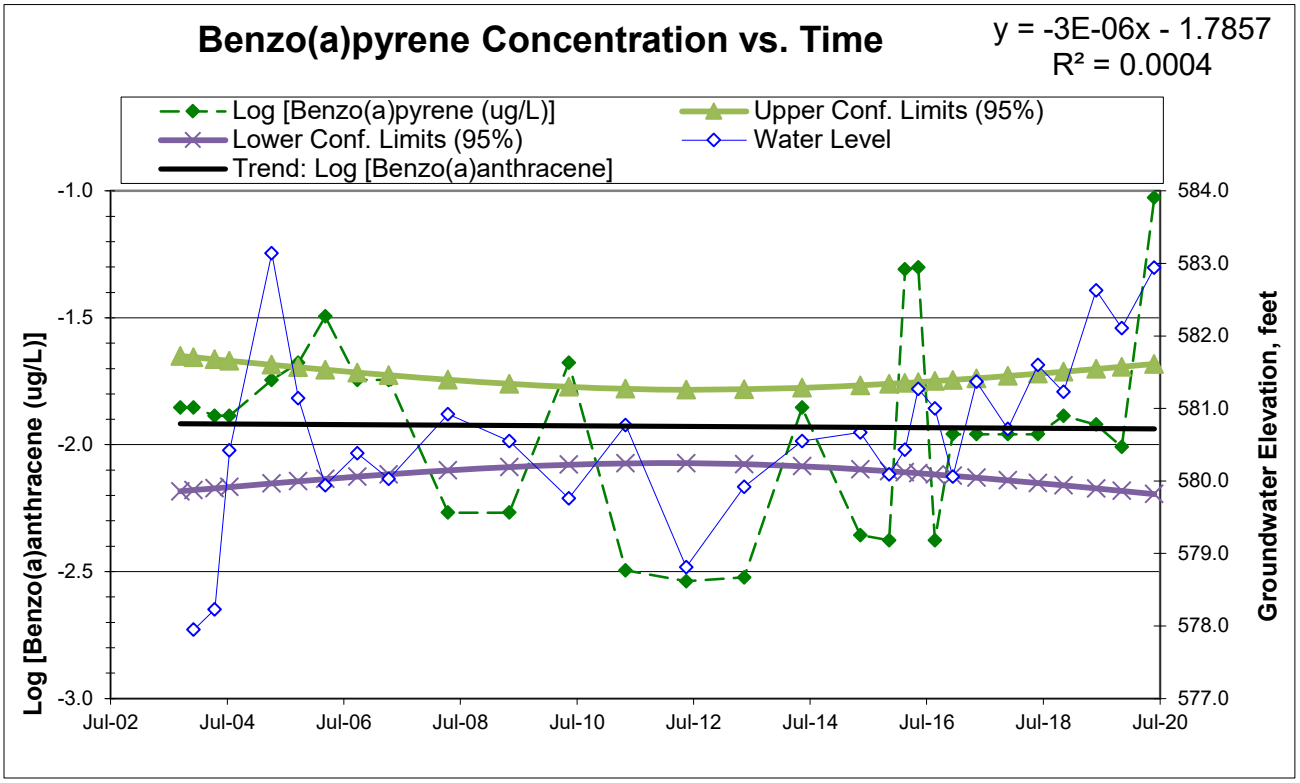


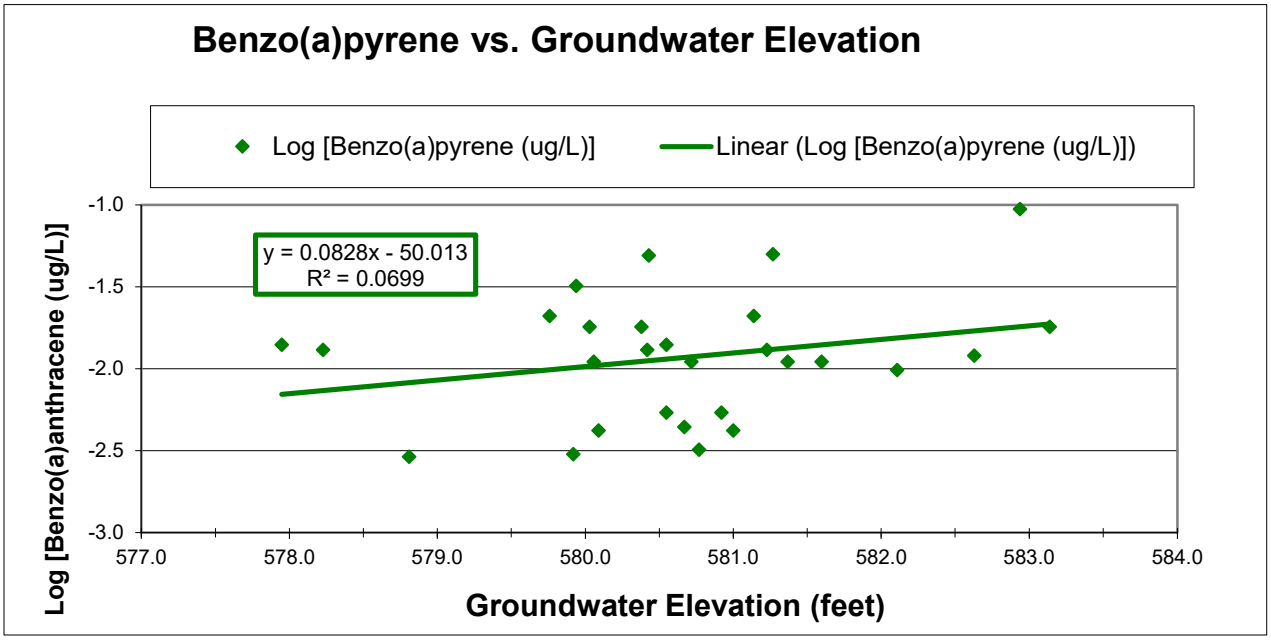




MW-412

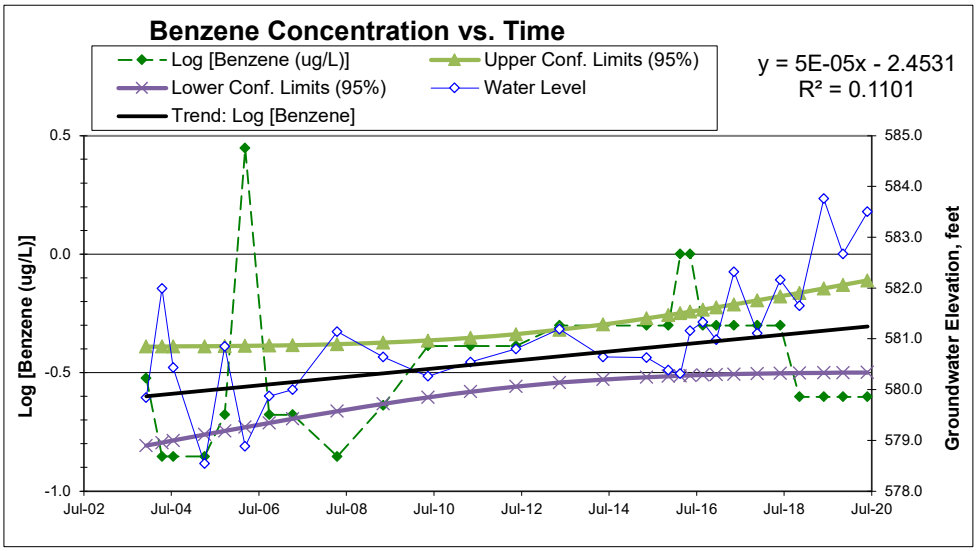
Former Green Bay MGP Site - Wisconsin Public Service Corporation

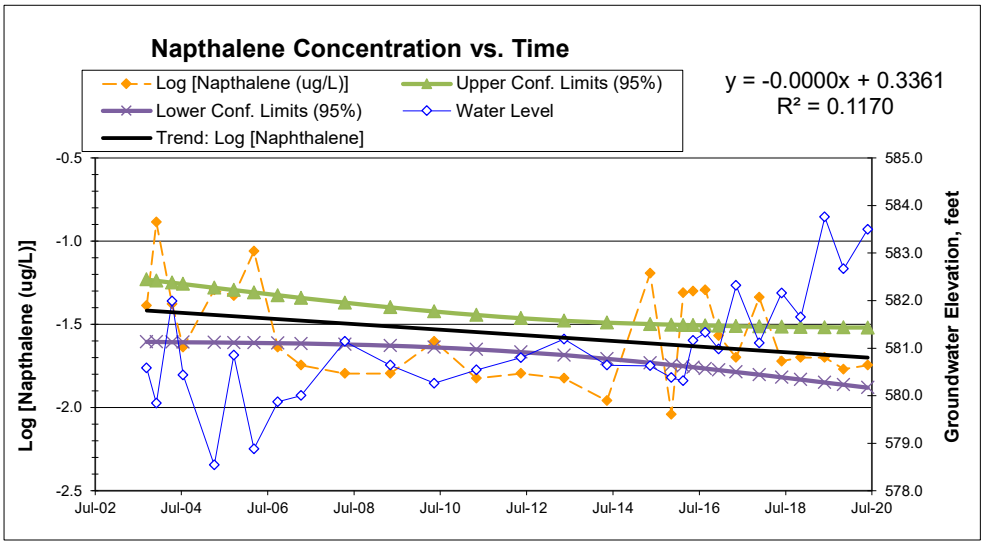


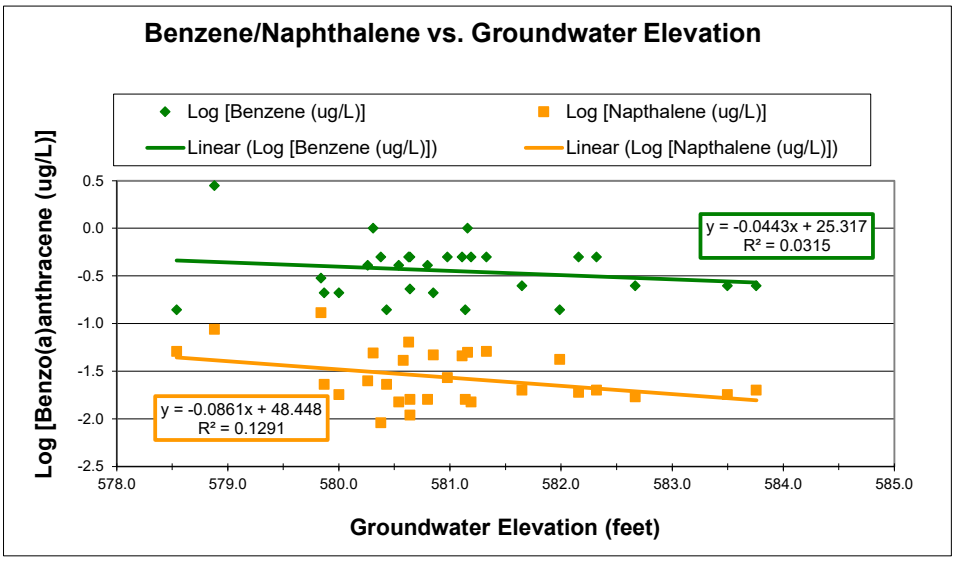


MW-413

Former Green Bay MGP Site - Wisconsin Public Service Corporation

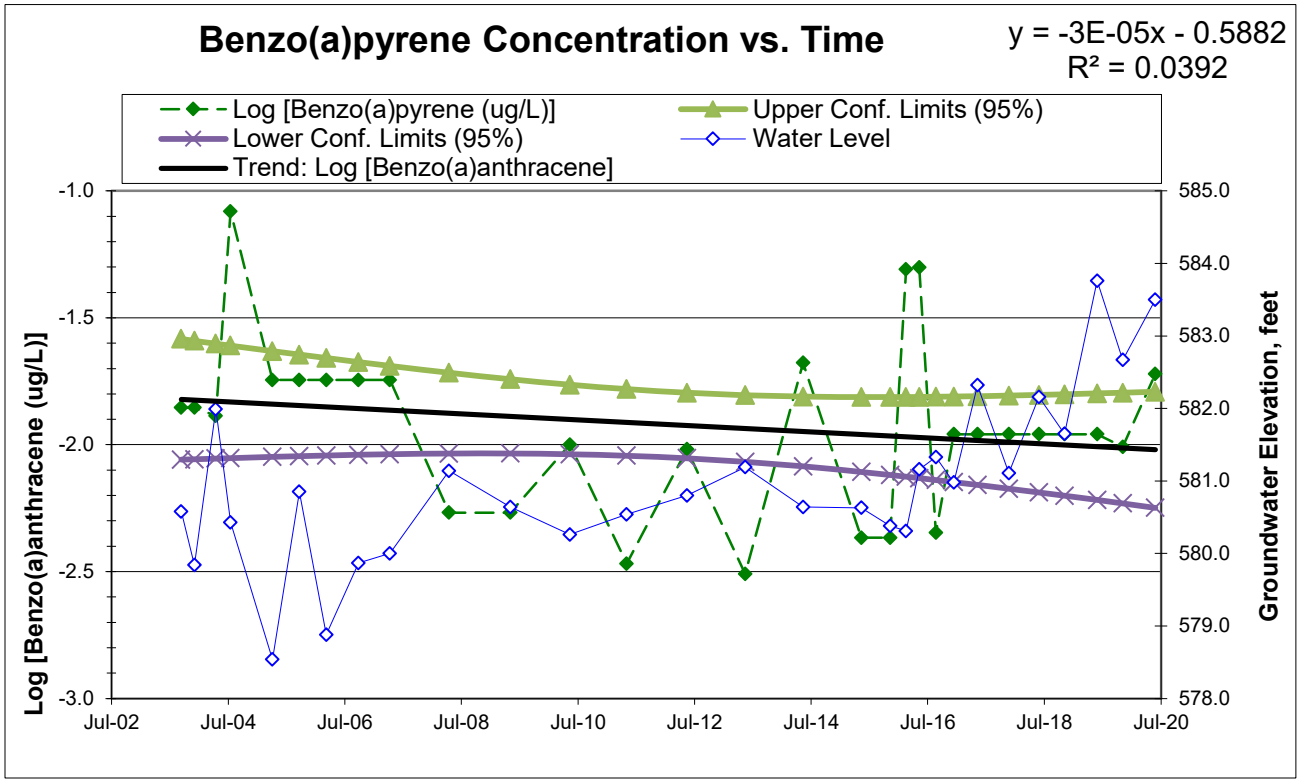


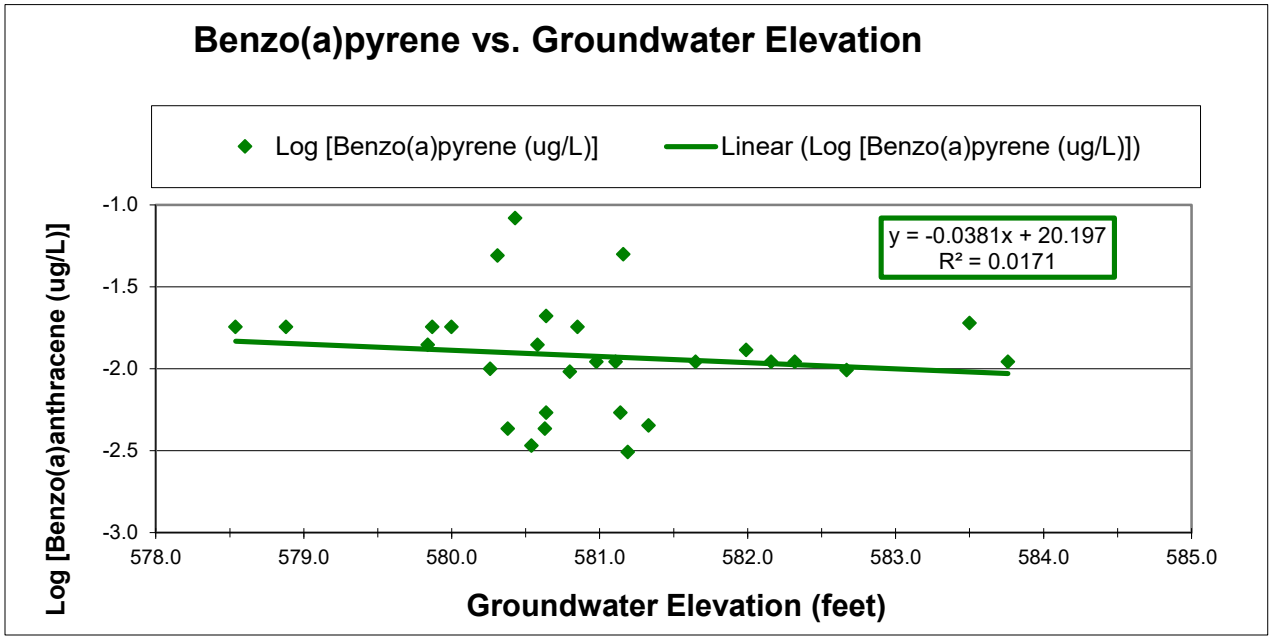




MW-413

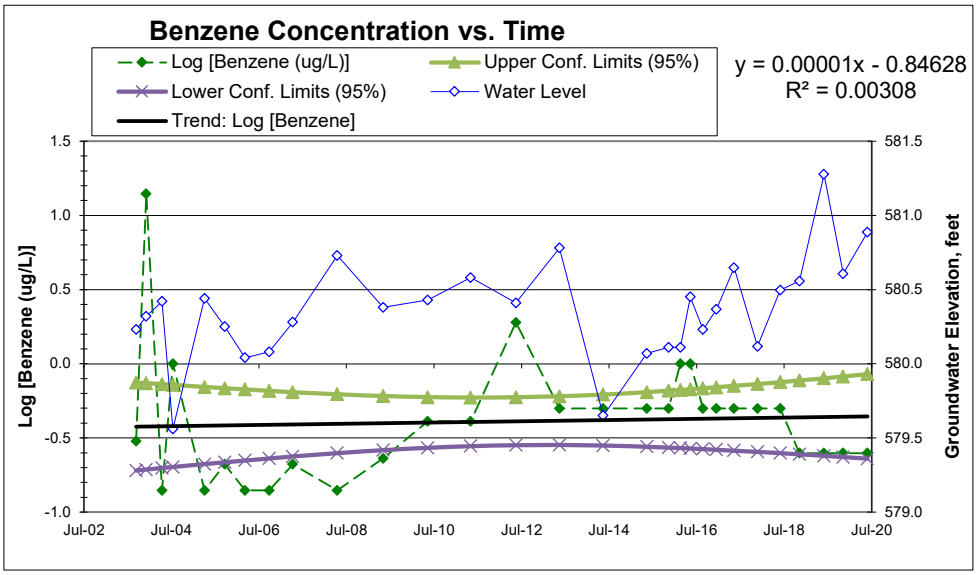
Former Green Bay MGP Site - Wisconsin Public Service Corporation

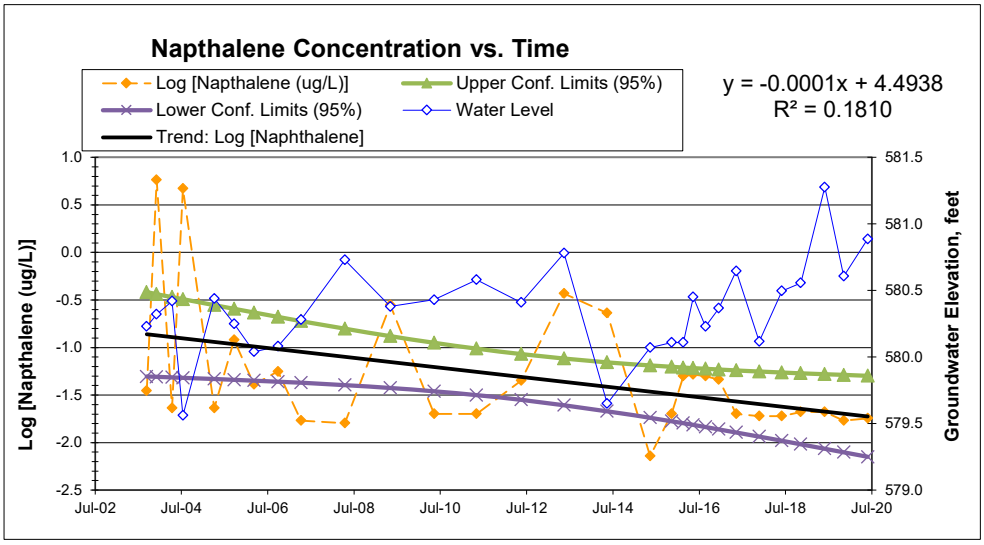


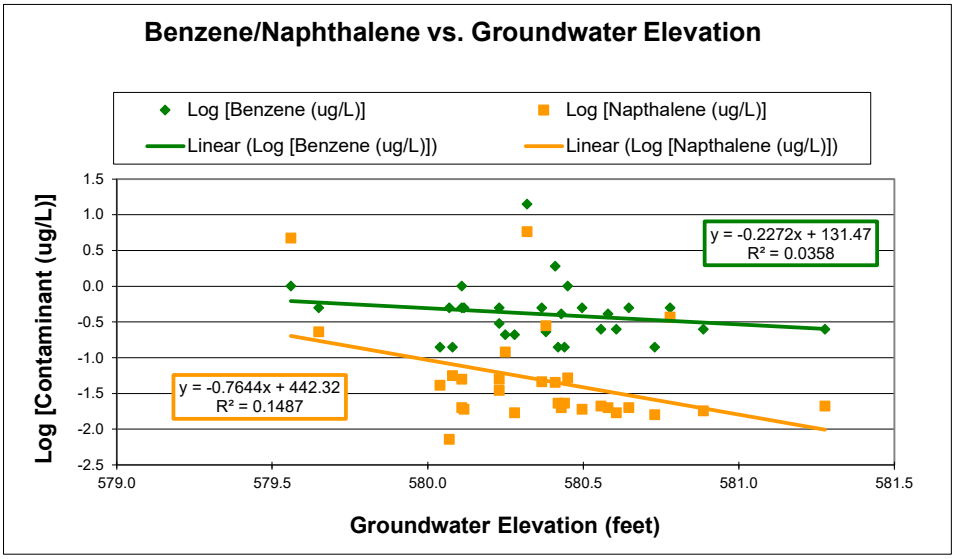


MW-414

Former Green Bay MGP Site - Wisconsin Public Service Corporation

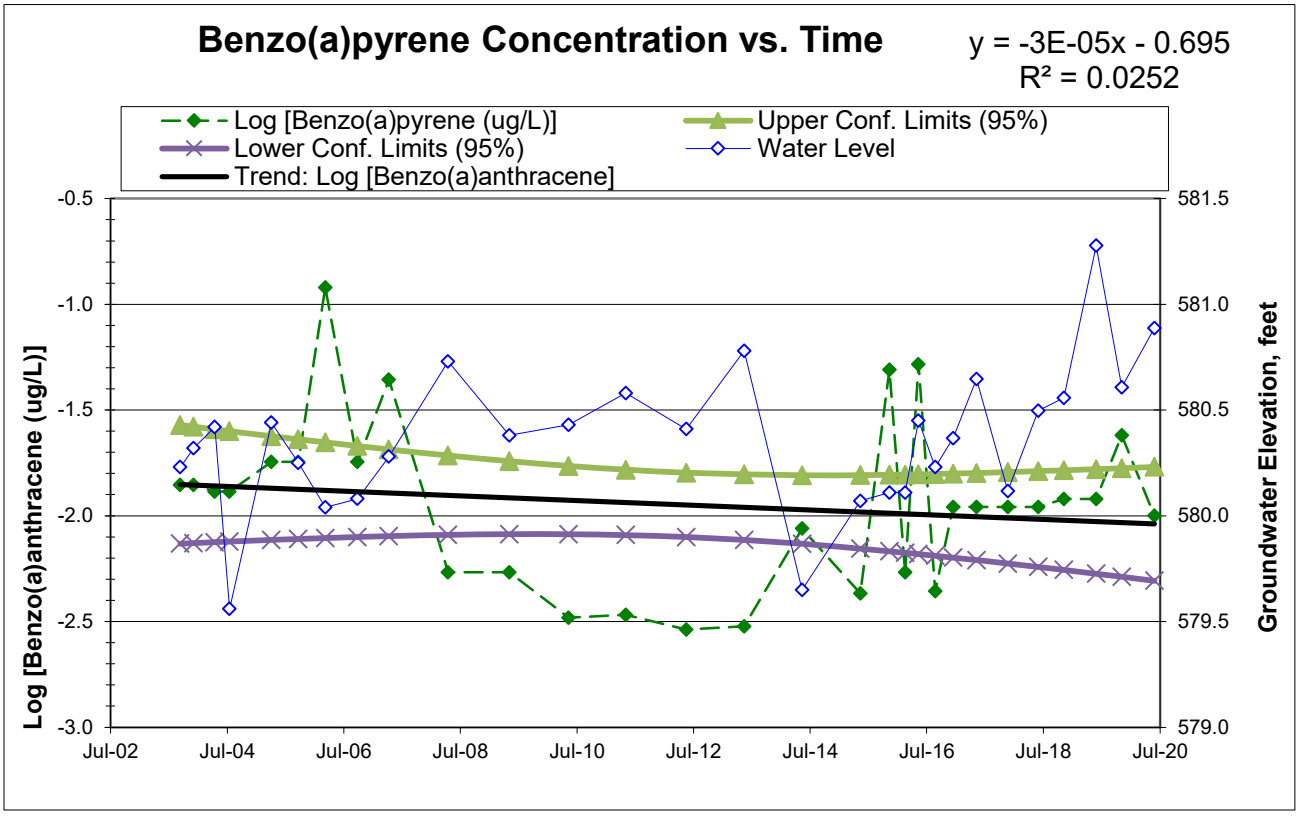


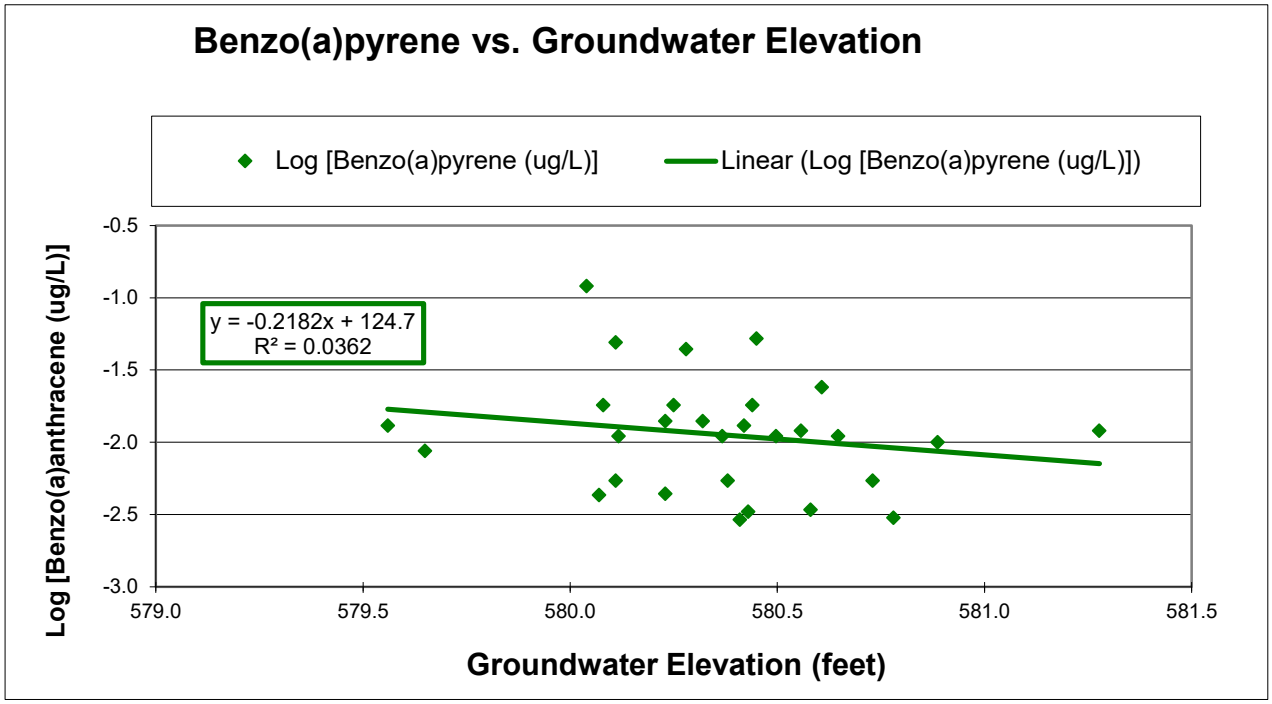




MW-414

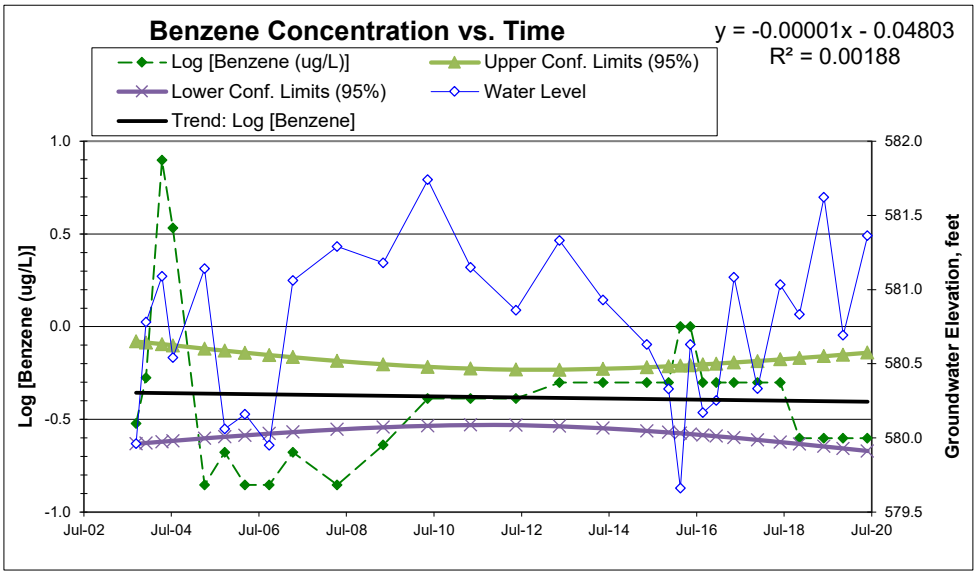
Former Green Bay MGP Site - Wisconsin Public Service Corporation

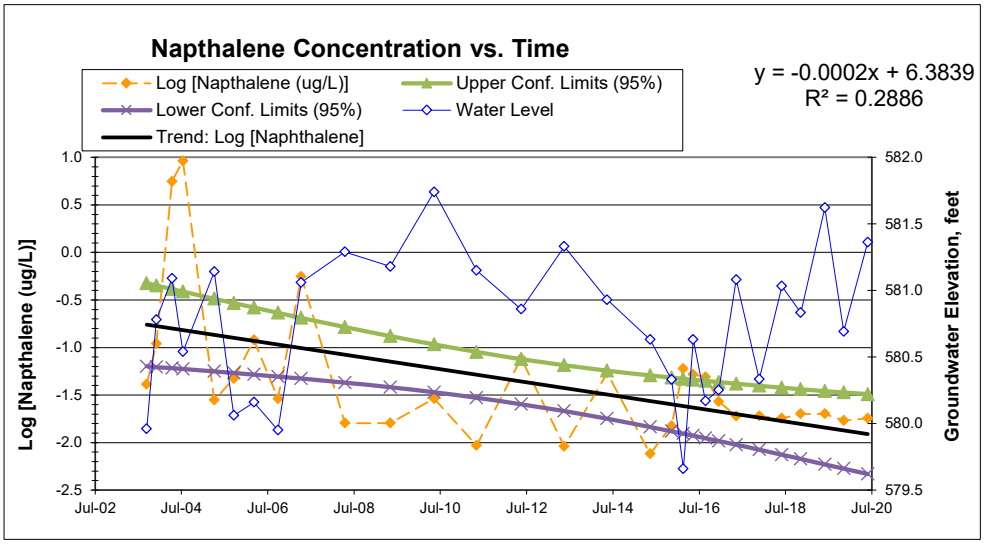


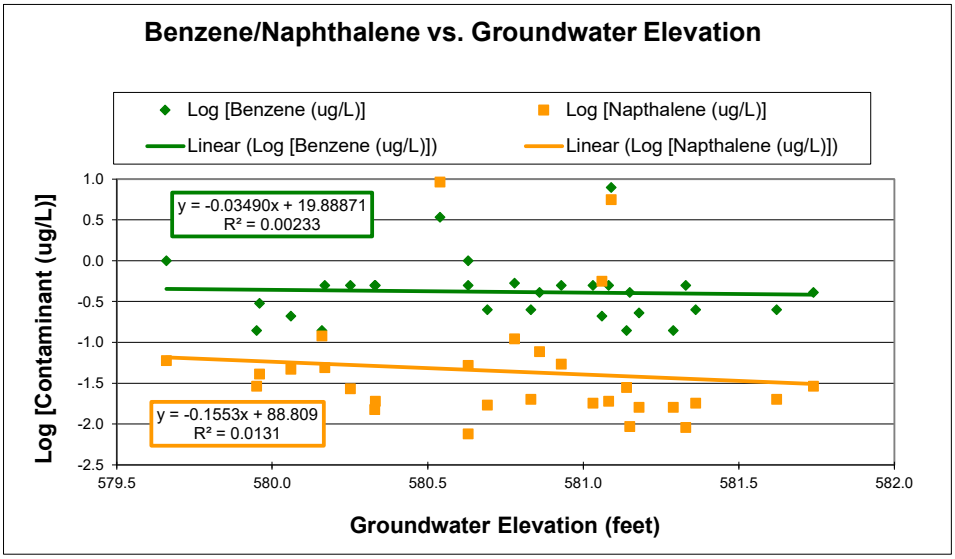


MW-415A

Former Green Bay MGP Site - Wisconsin Public Service Corporation

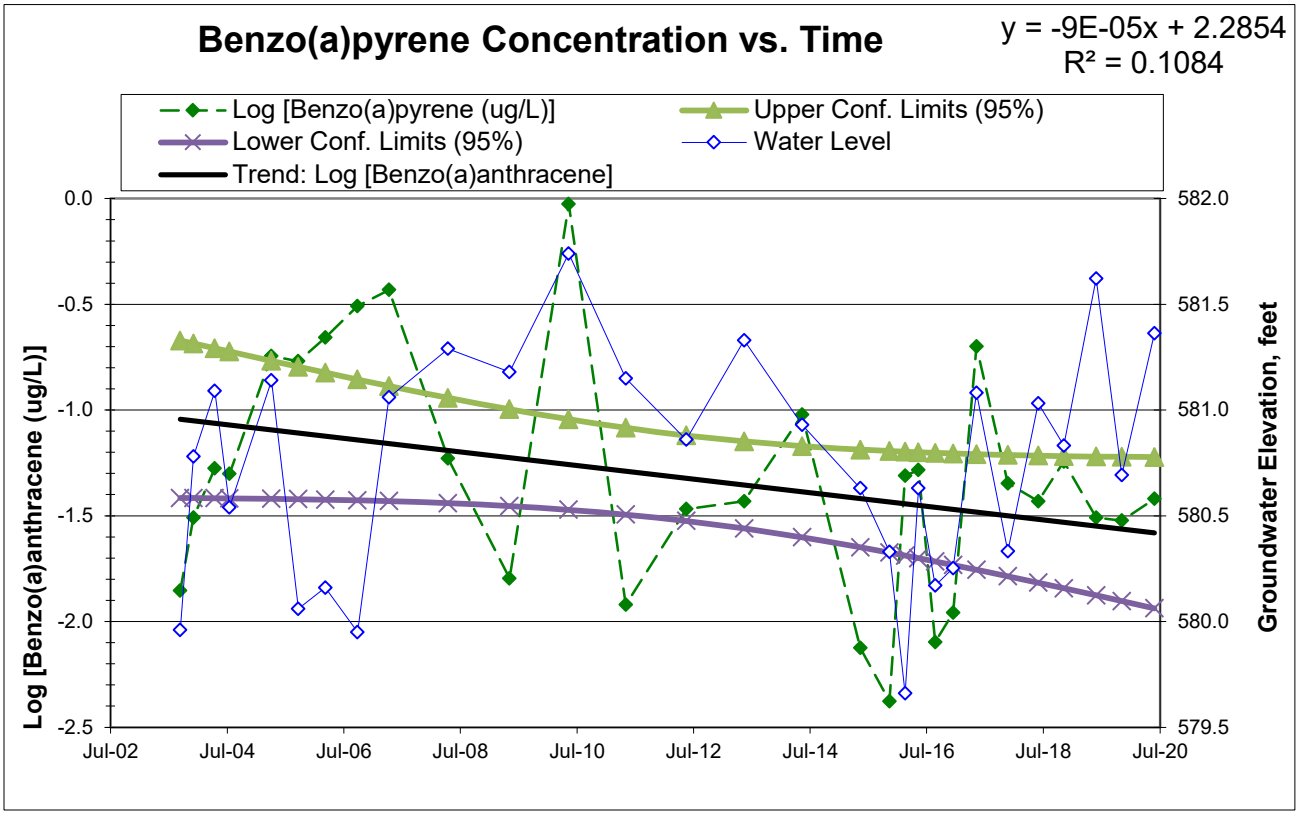


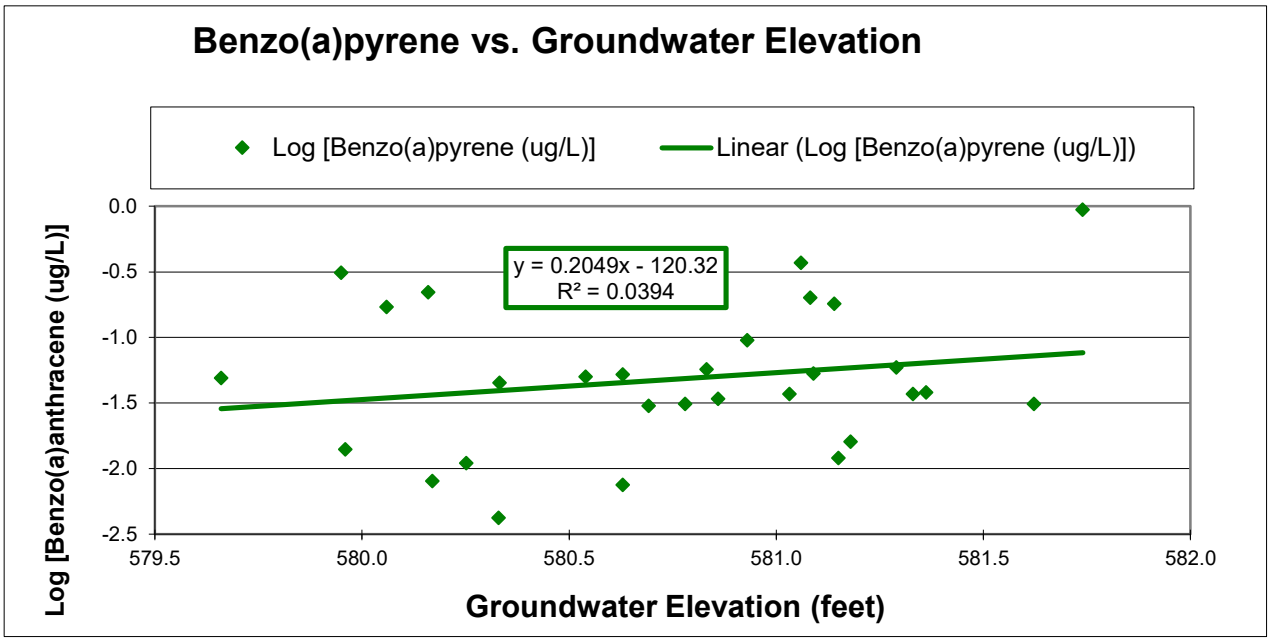




MW-415A

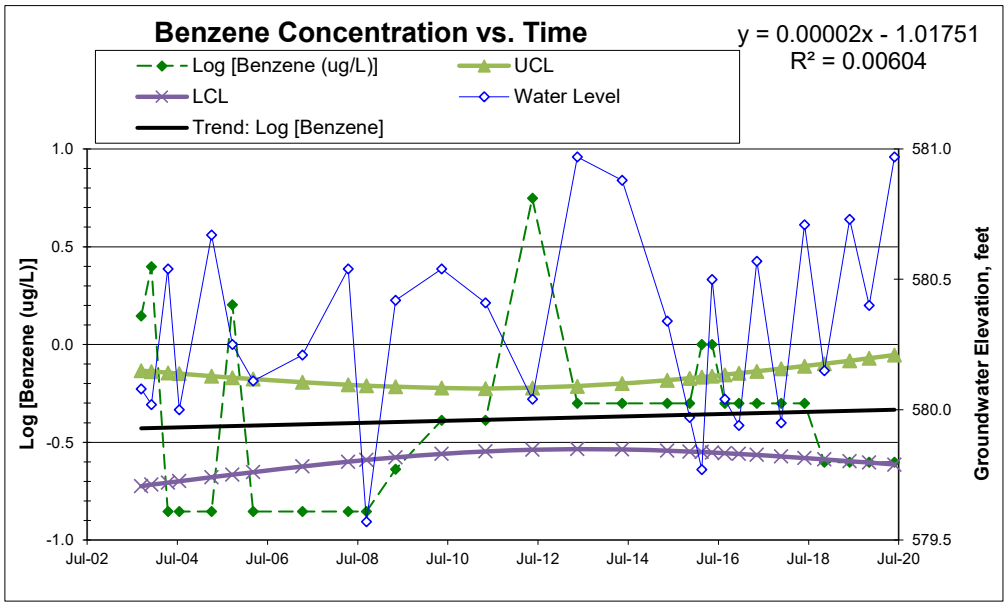
Former Green Bay MGP Site - Wisconsin Public Service Corporation

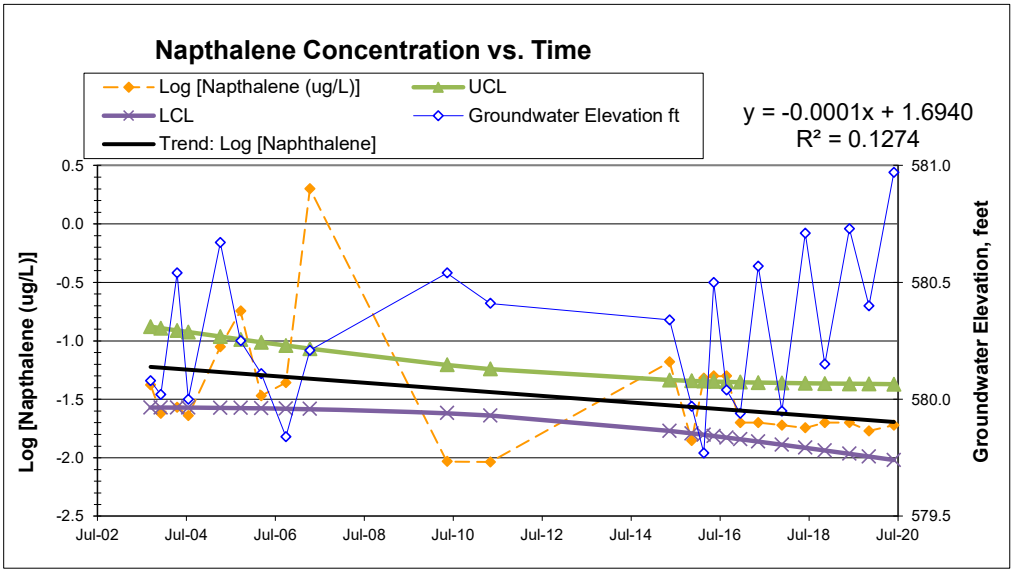


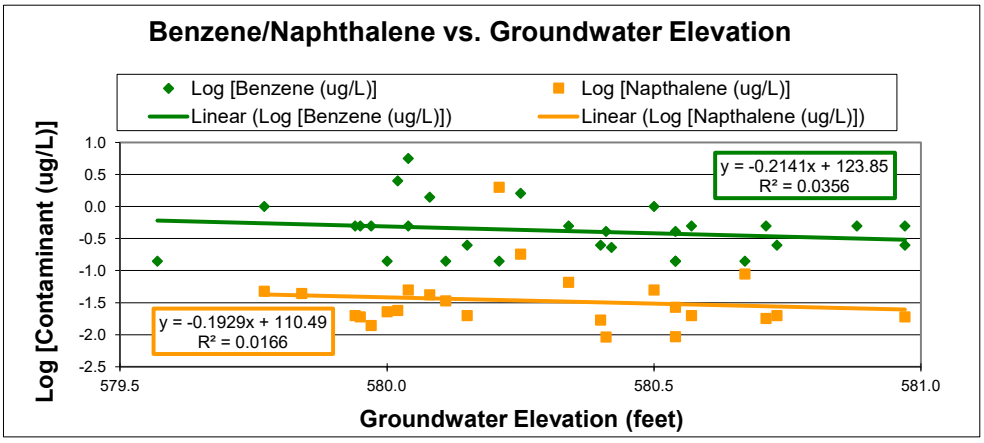


MW-416

Former Green Bay MGP Site - Wisconsin Public Service Corporation

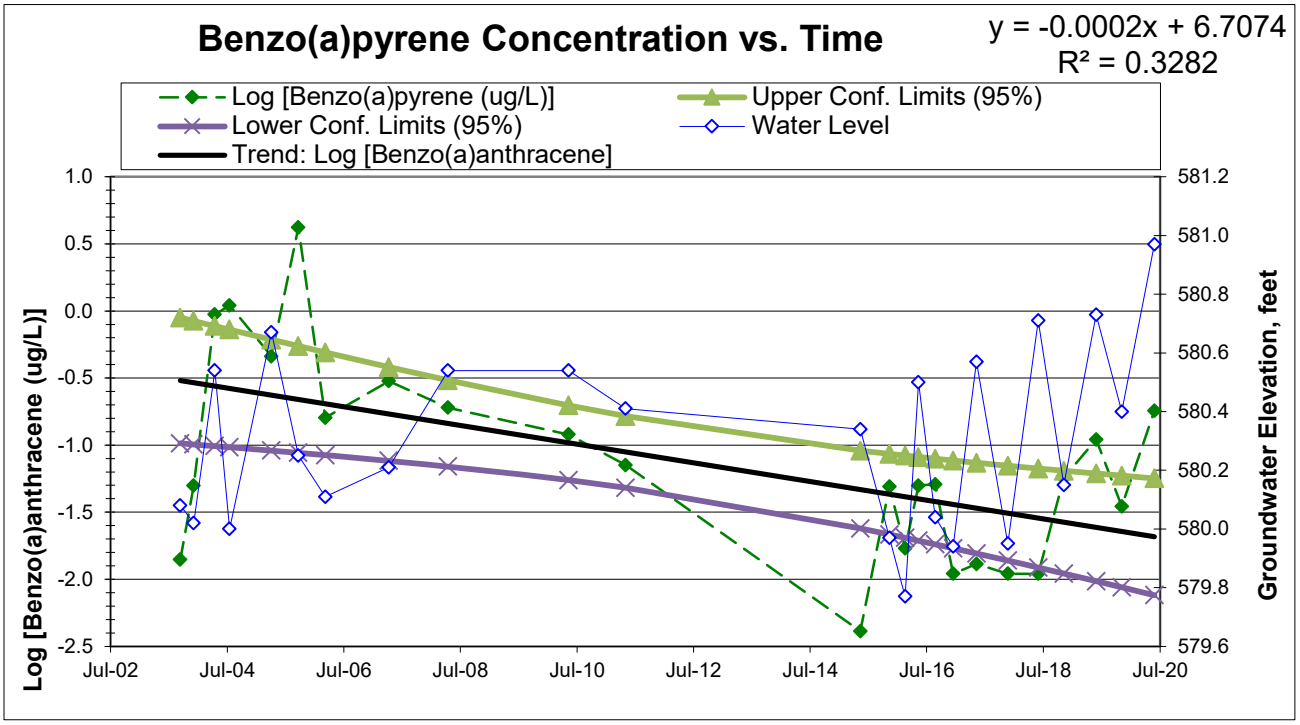


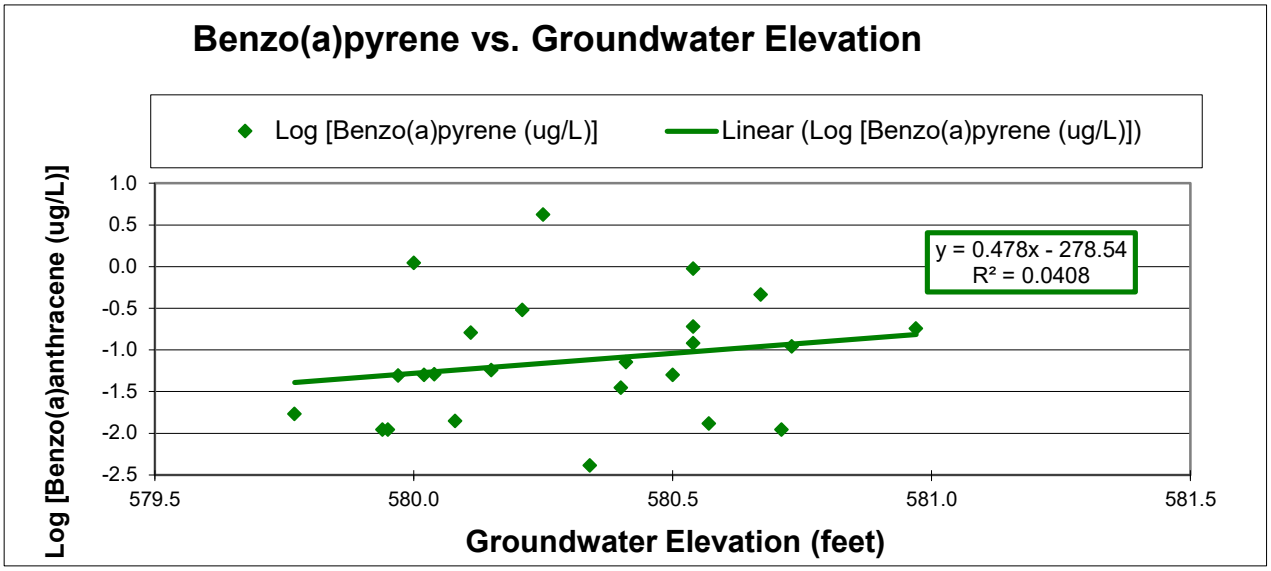




MW-416

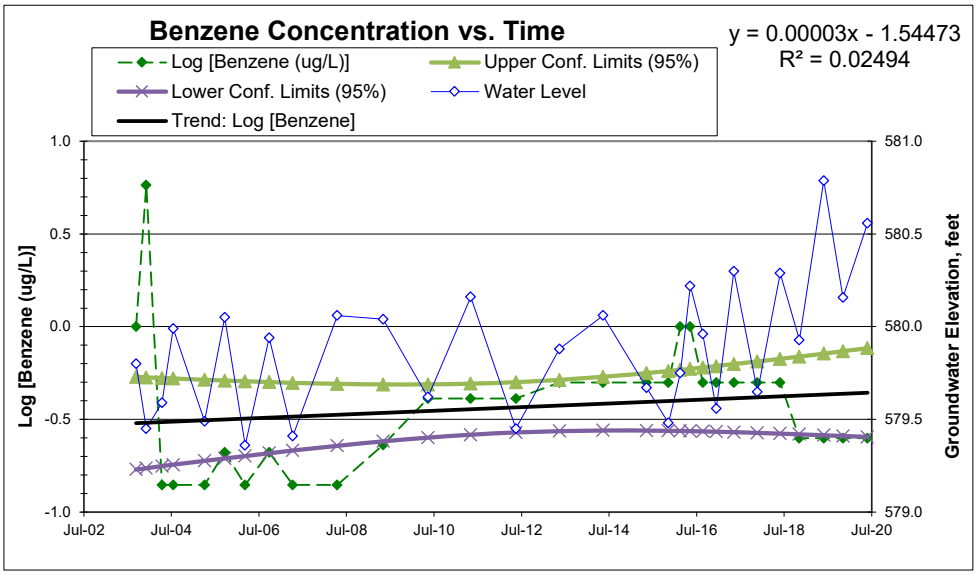
Former Green Bay MGP Site - Wisconsin Public Service Corporation

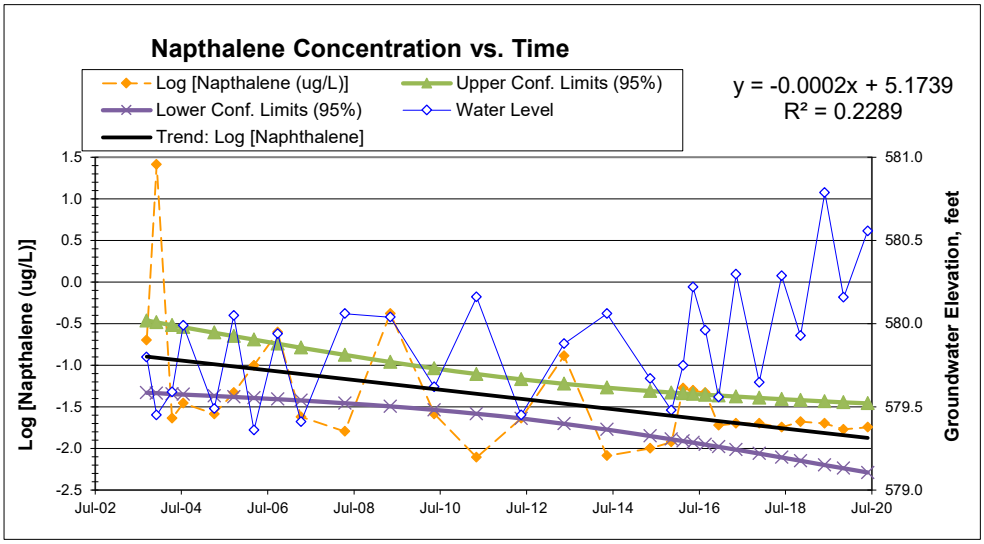


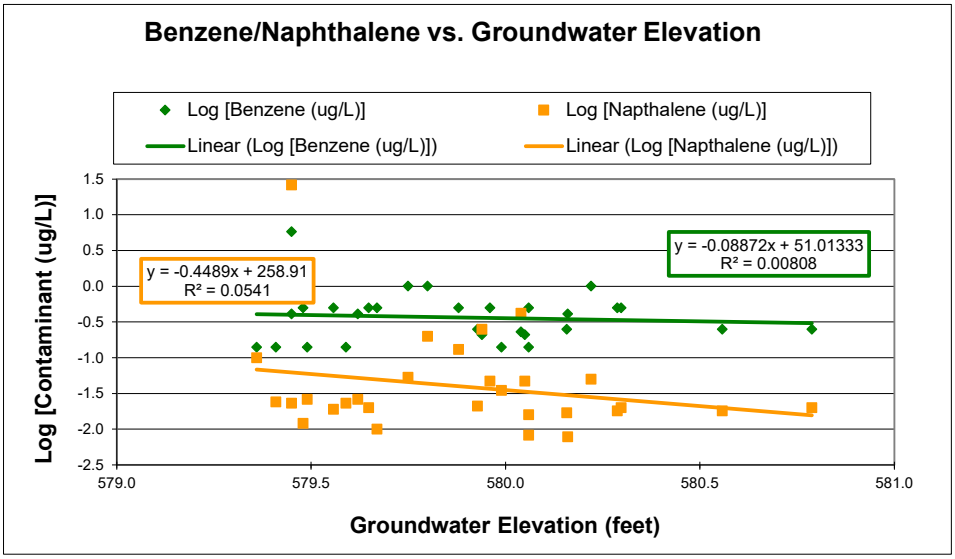


MW-417

Former Green Bay MGP Site - Wisconsin Public Service Corporation

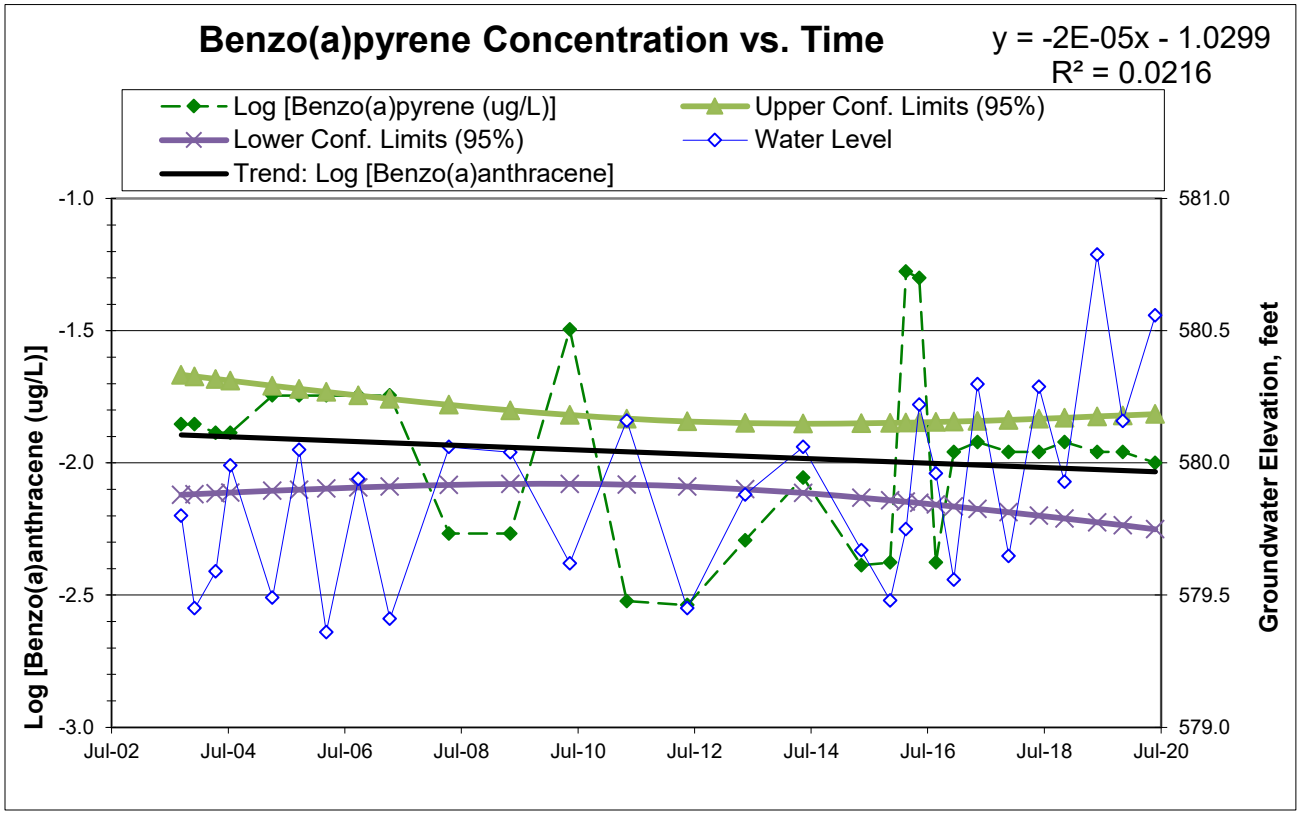


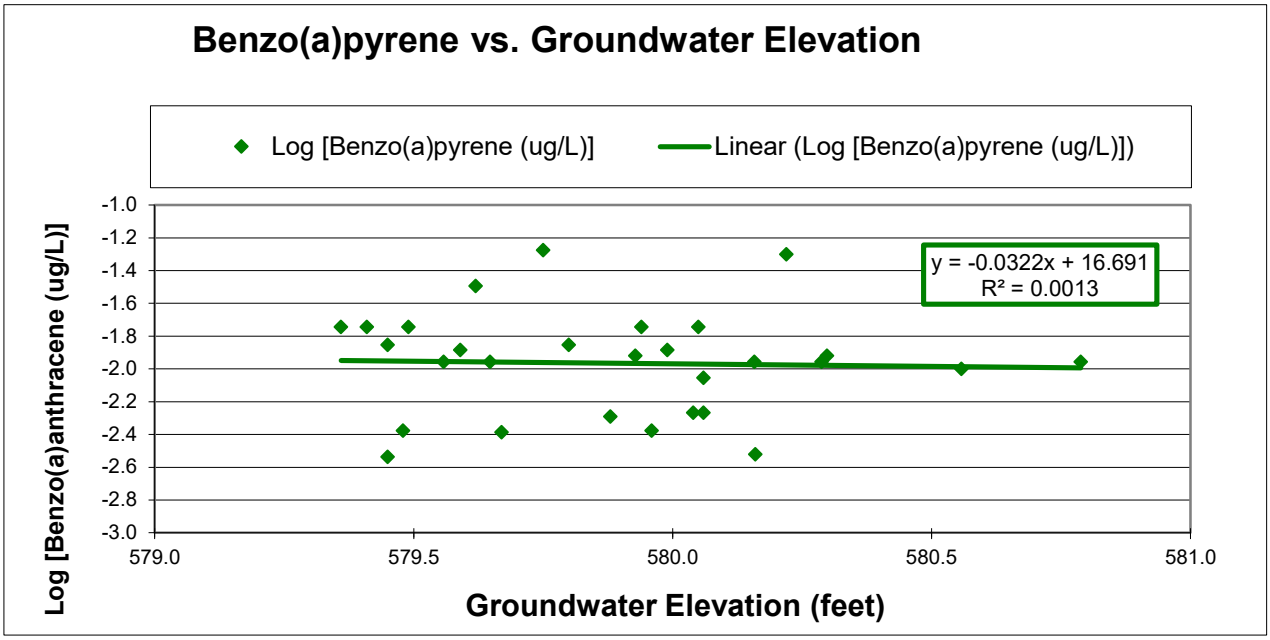




MW-417

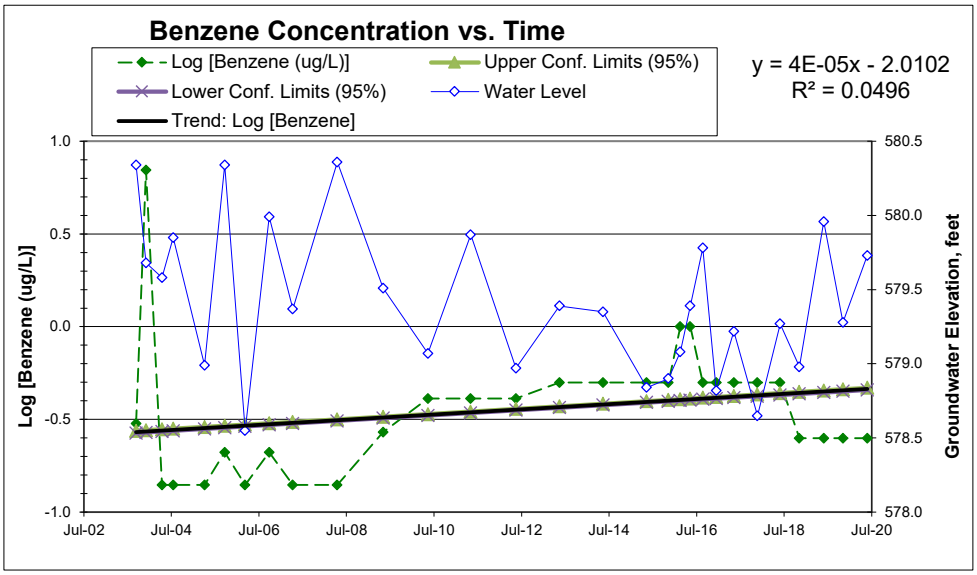
Former Green Bay MGP Site - Wisconsin Public Service Corporation

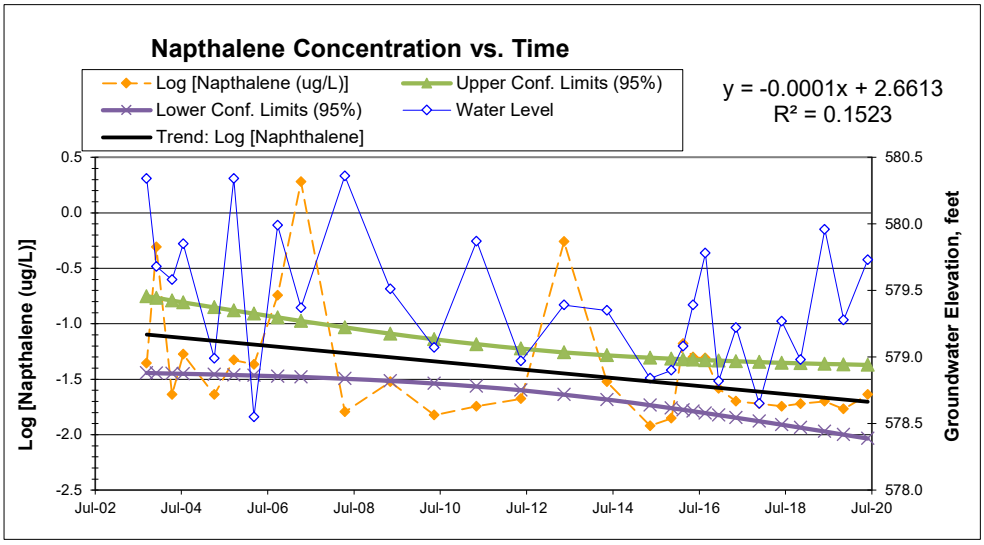


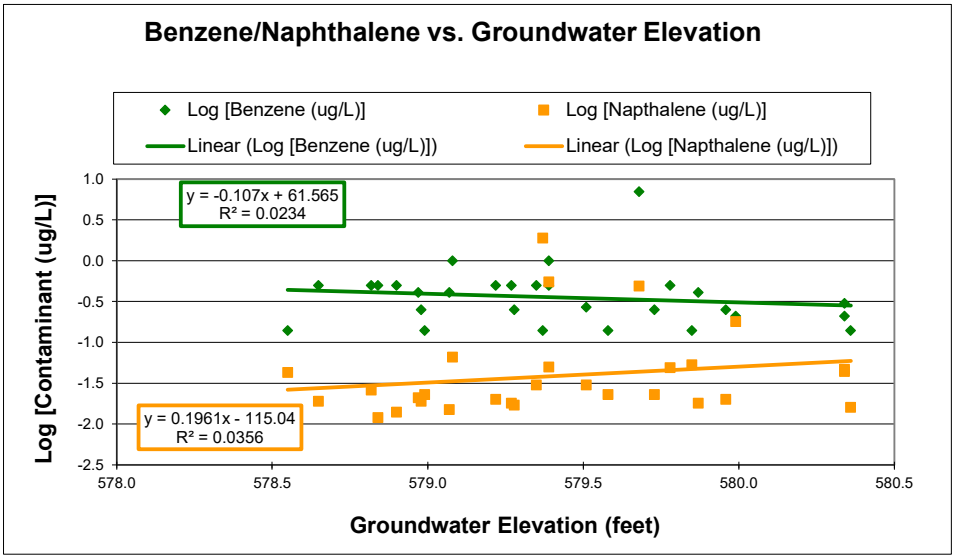


MW-418

Former Green Bay MGP Site - Wisconsin Public Service Corporation

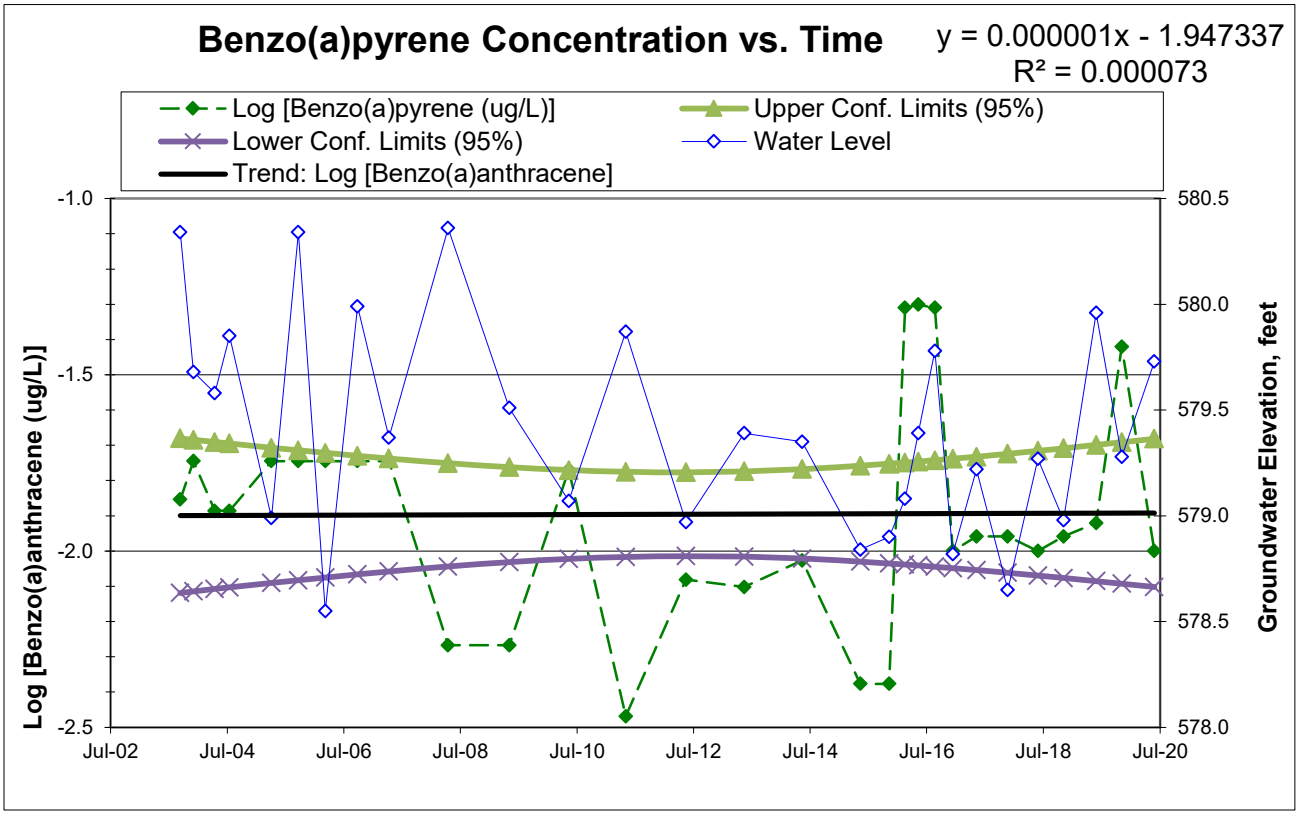


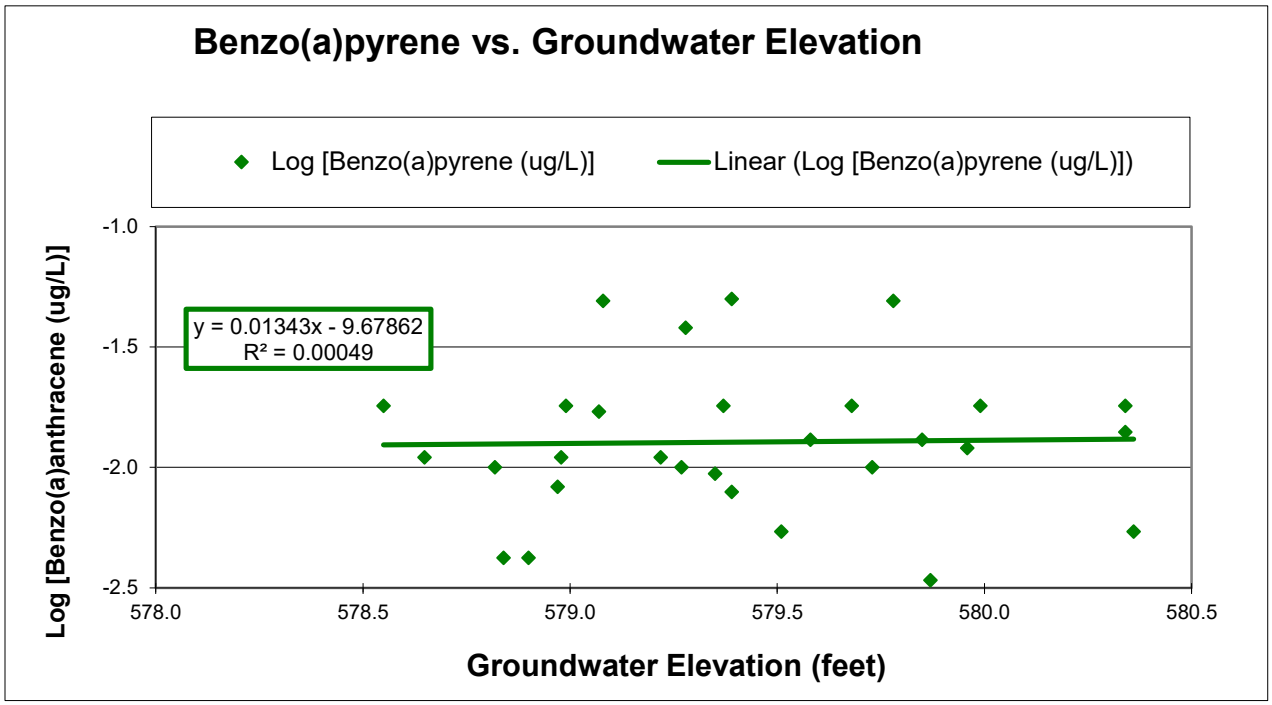




MW-418

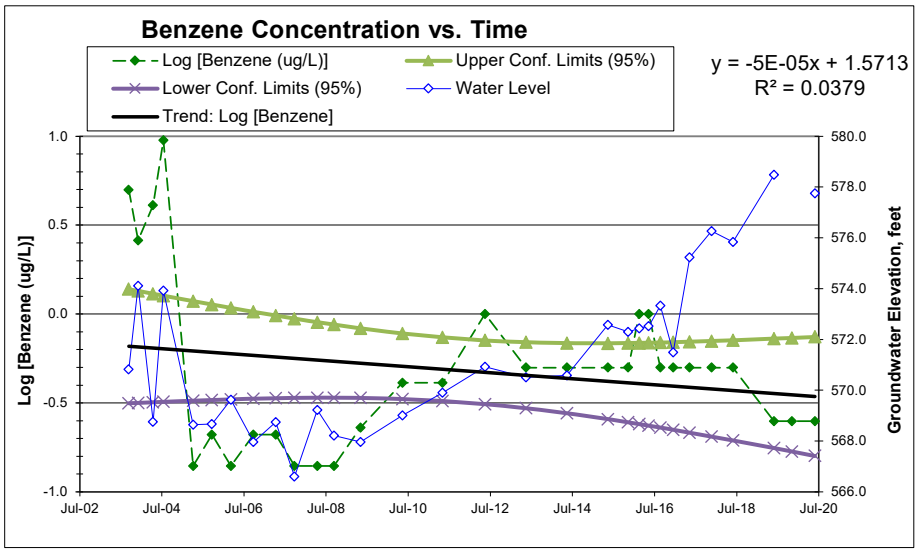
Former Green Bay MGP Site - Wisconsin Public Service Corporation

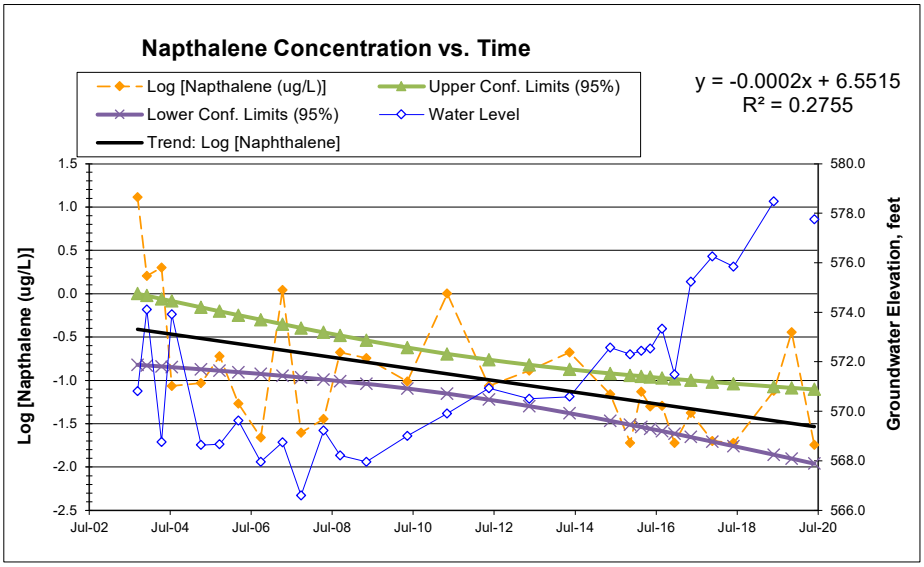


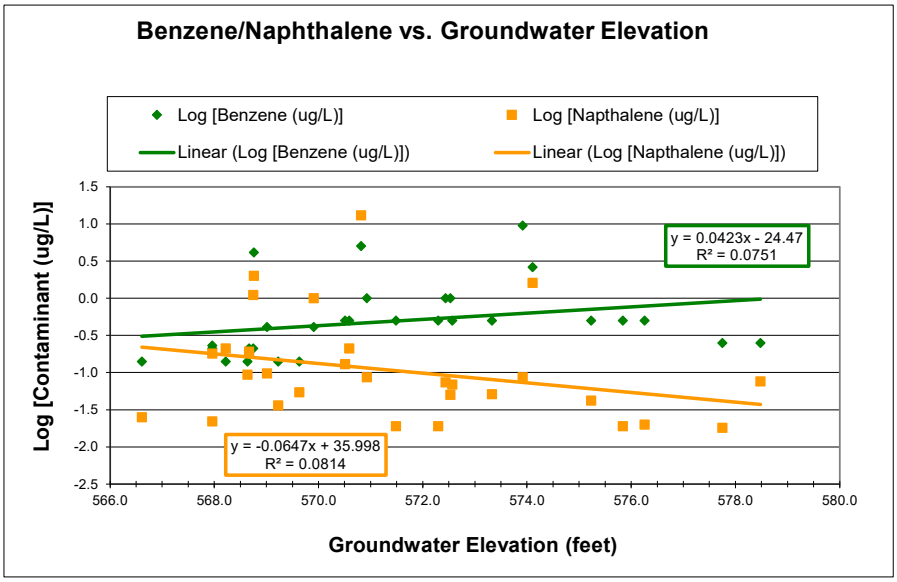


MW-401BR

Former Green Bay MGP Site - Wisconsin Public Service Corporation







MW-401BR

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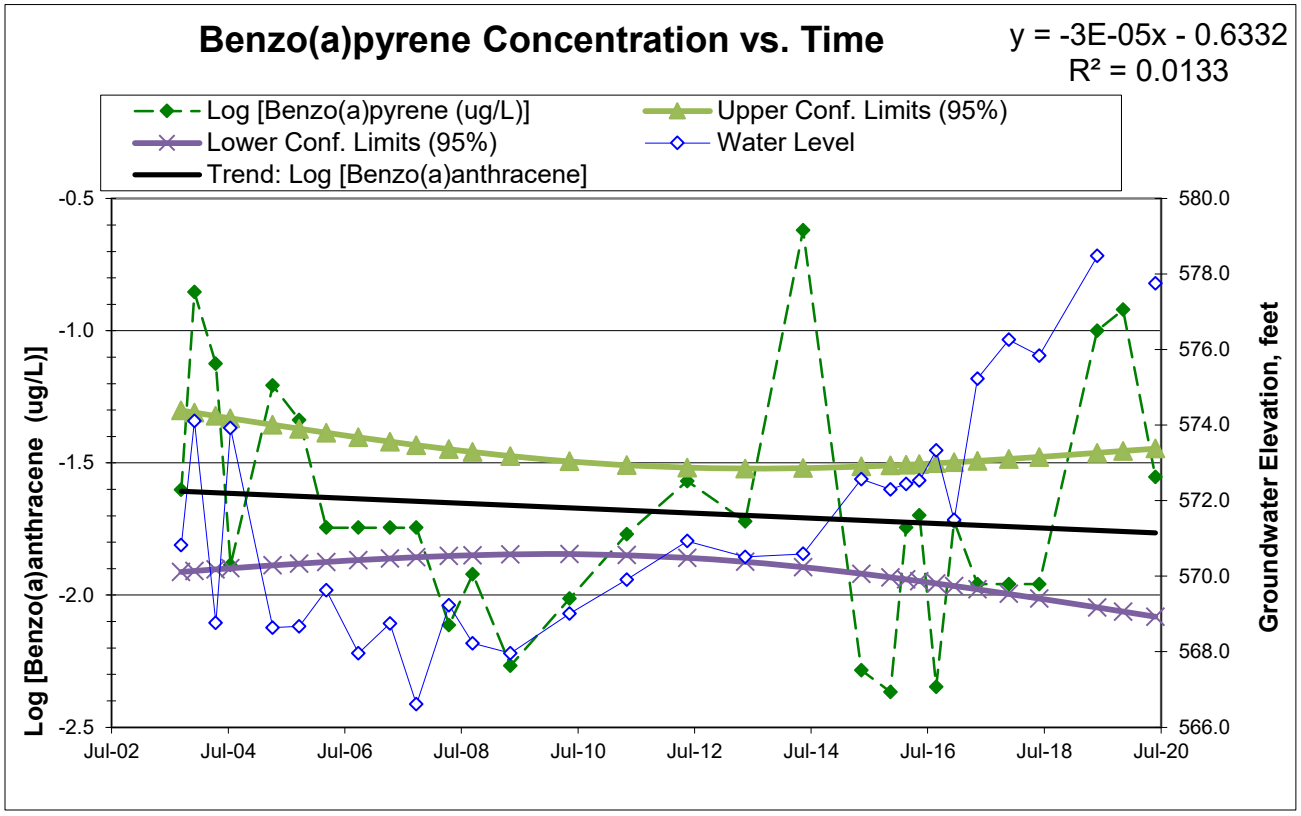

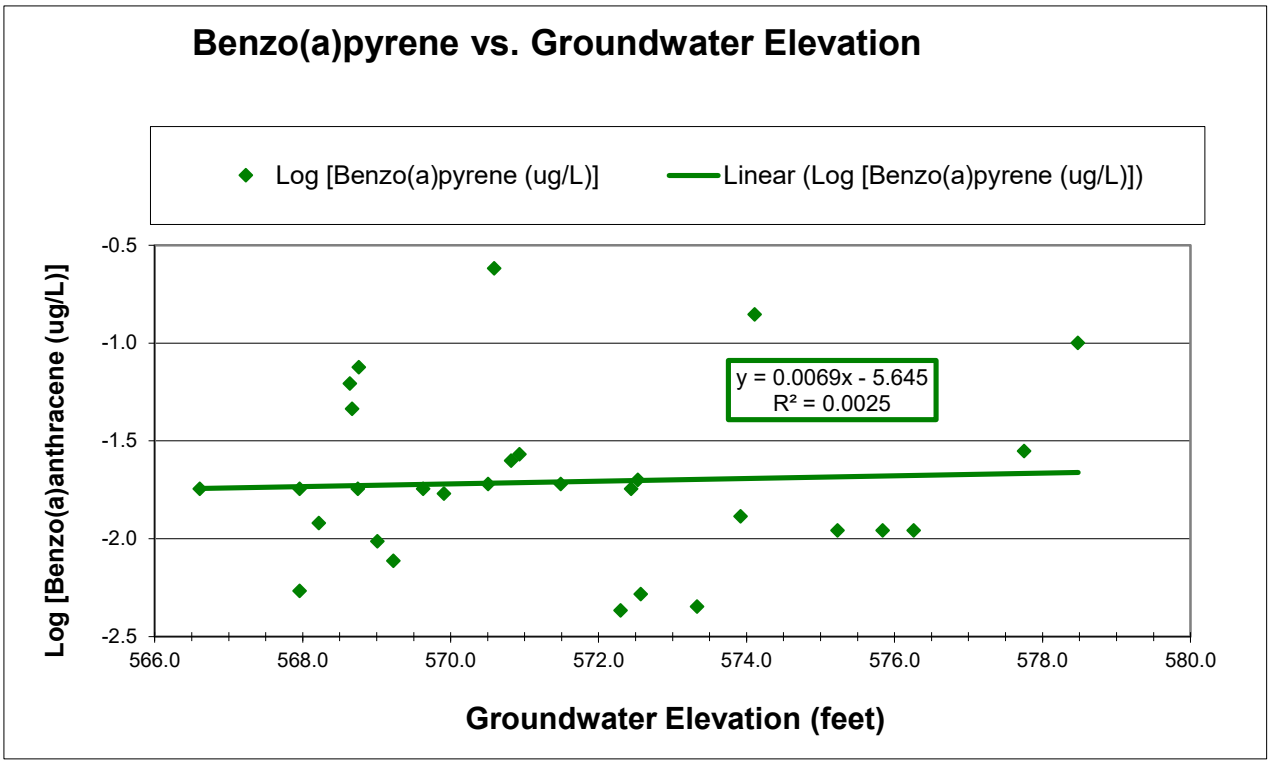

MW-405B

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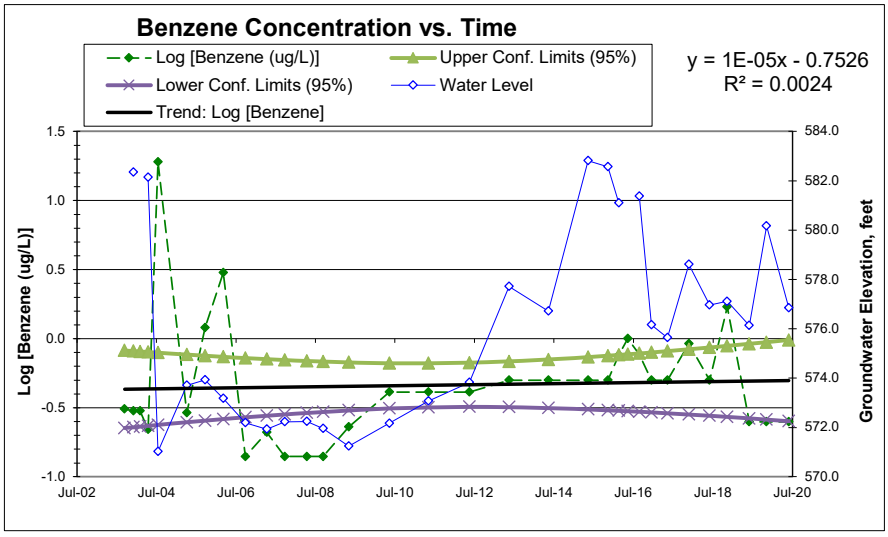
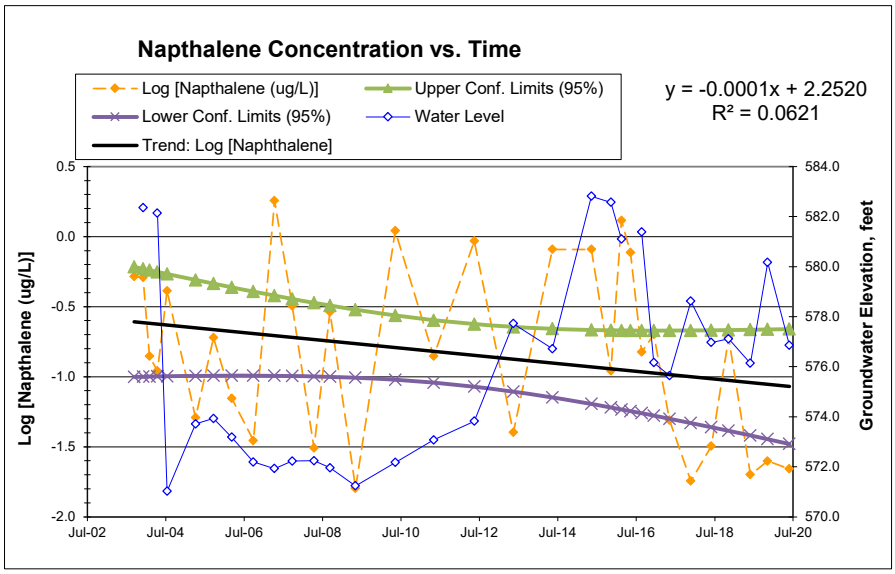
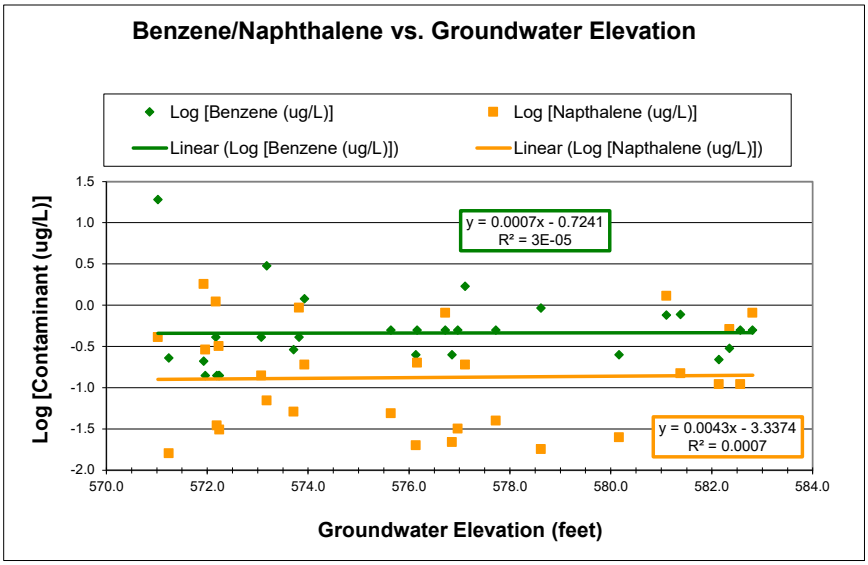
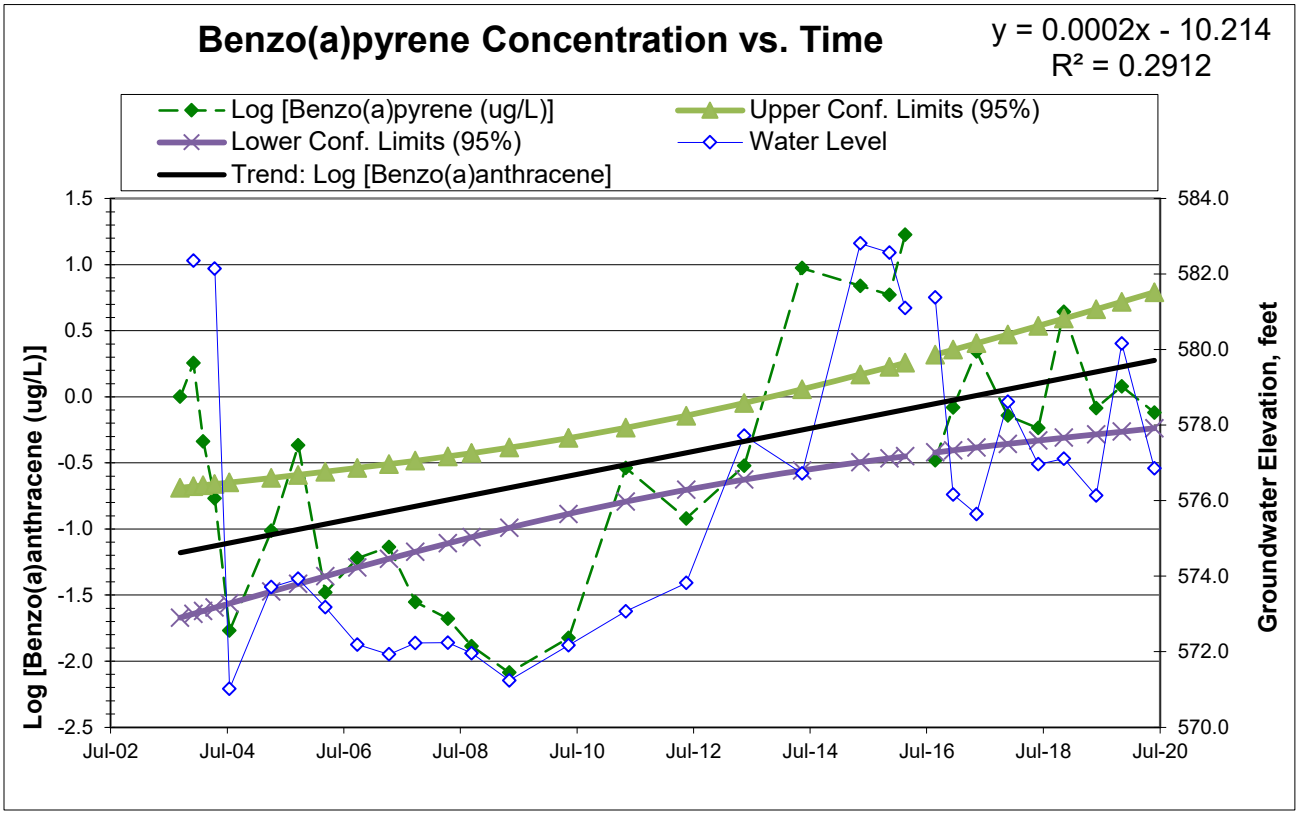


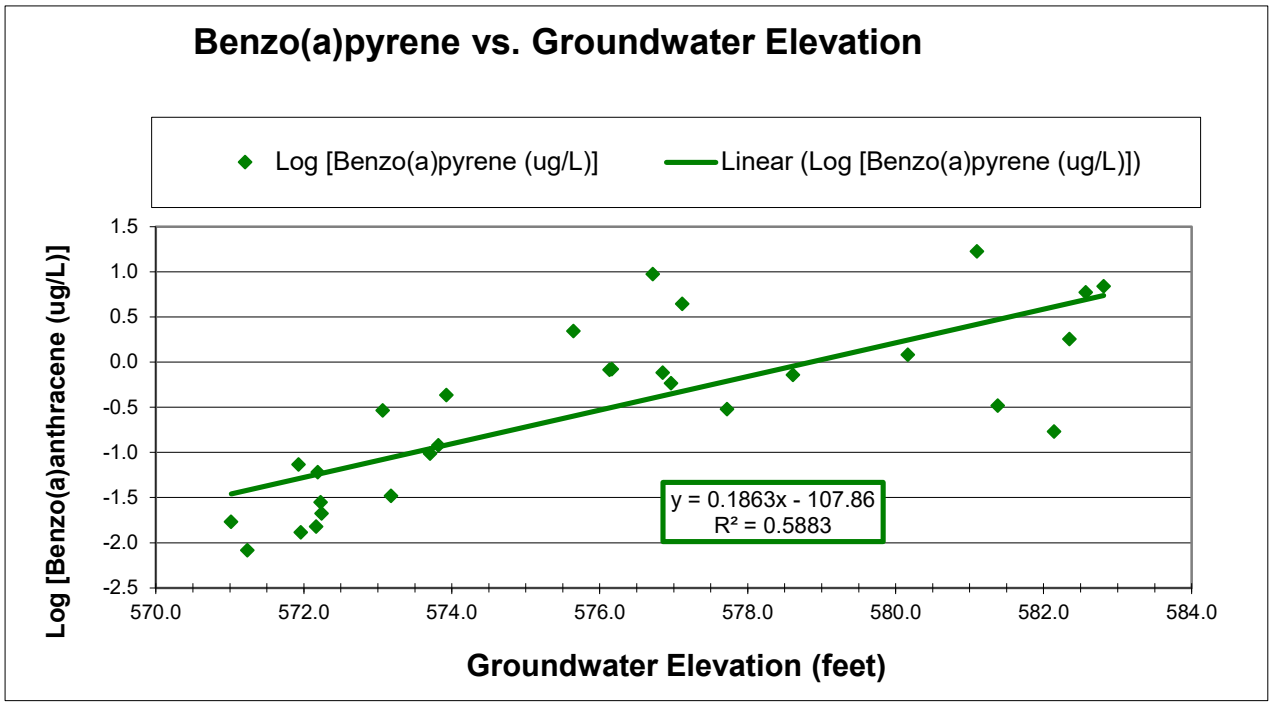




MW-405B

Former Green Bay MGP Site - Wisconsin Public Service Corporation





MW-409B

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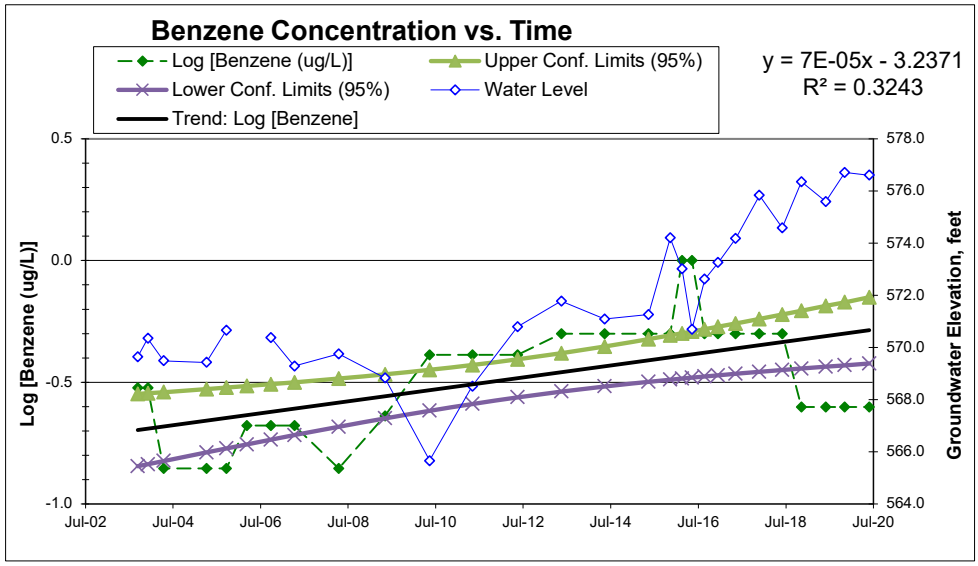

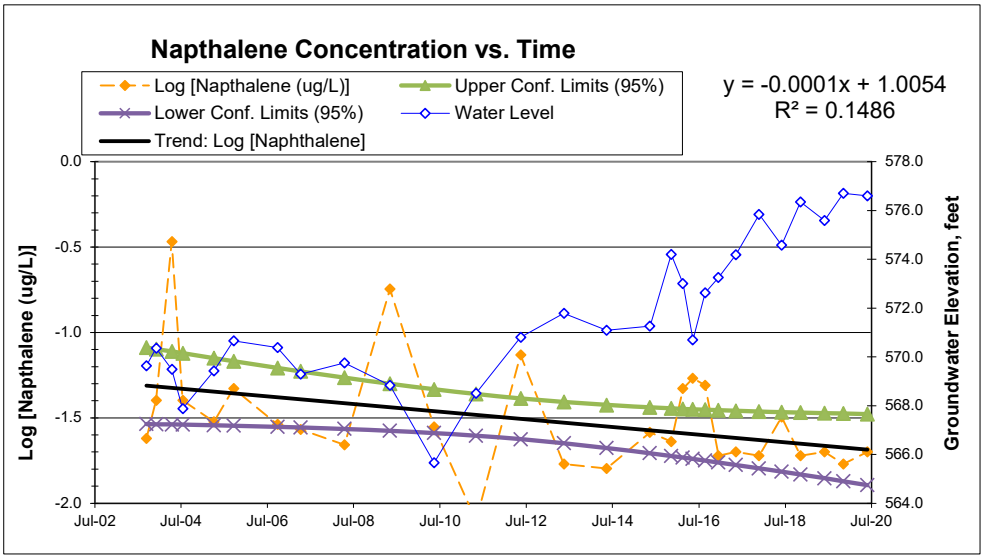

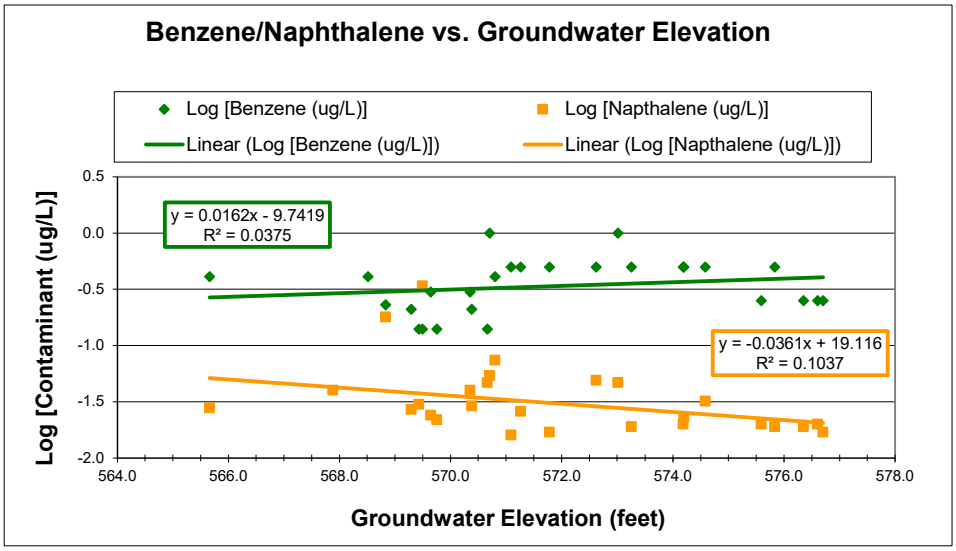

MW-409B

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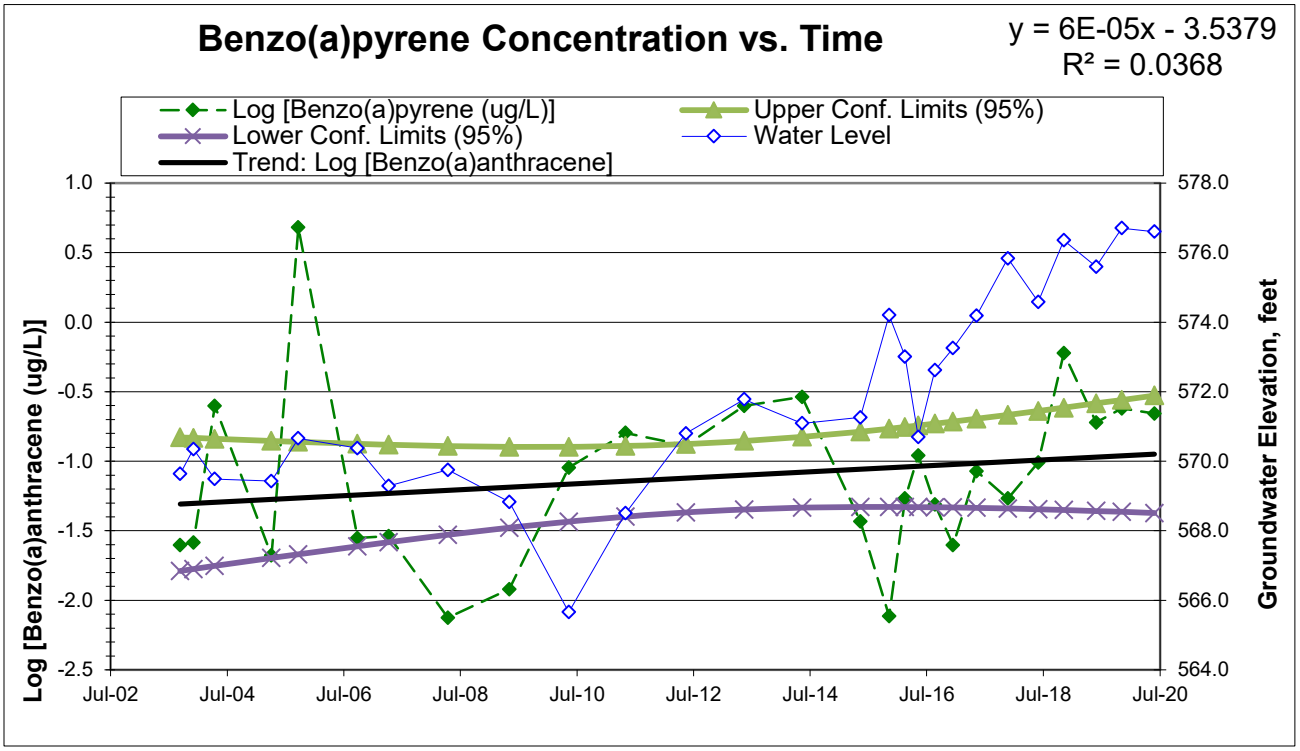

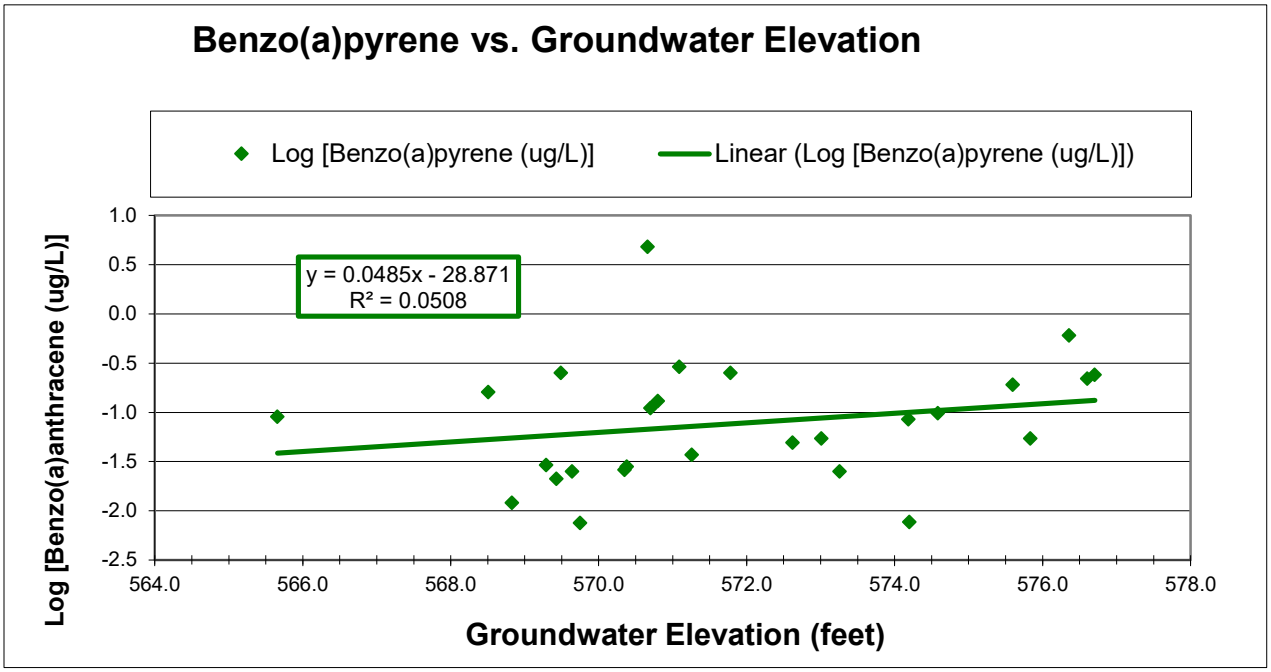

MW-411B

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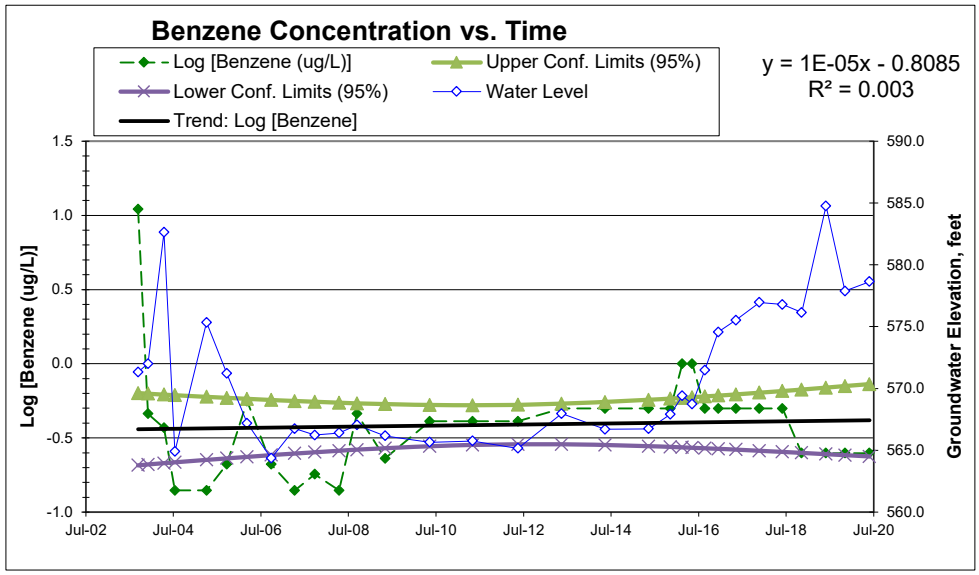

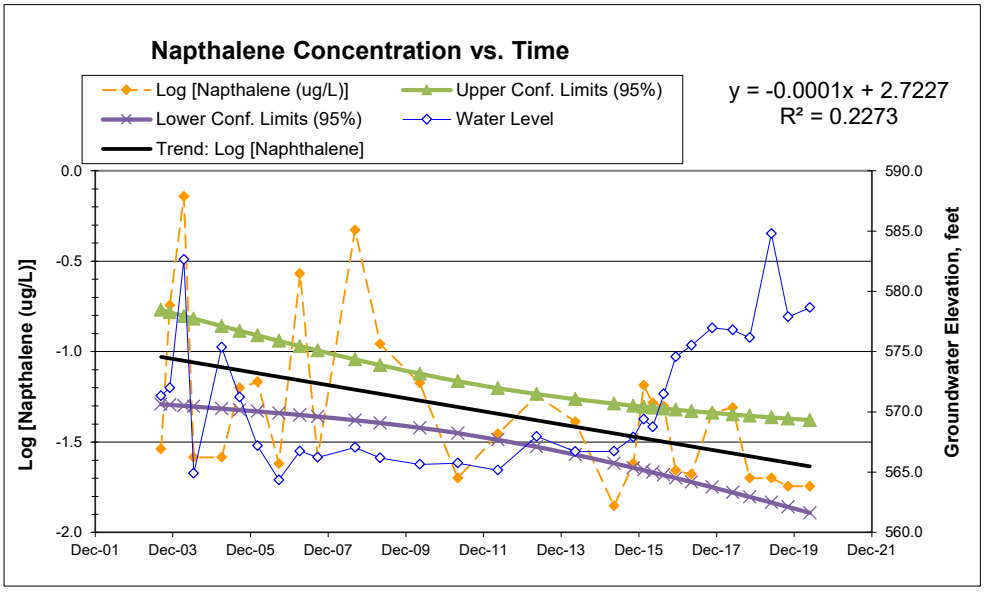

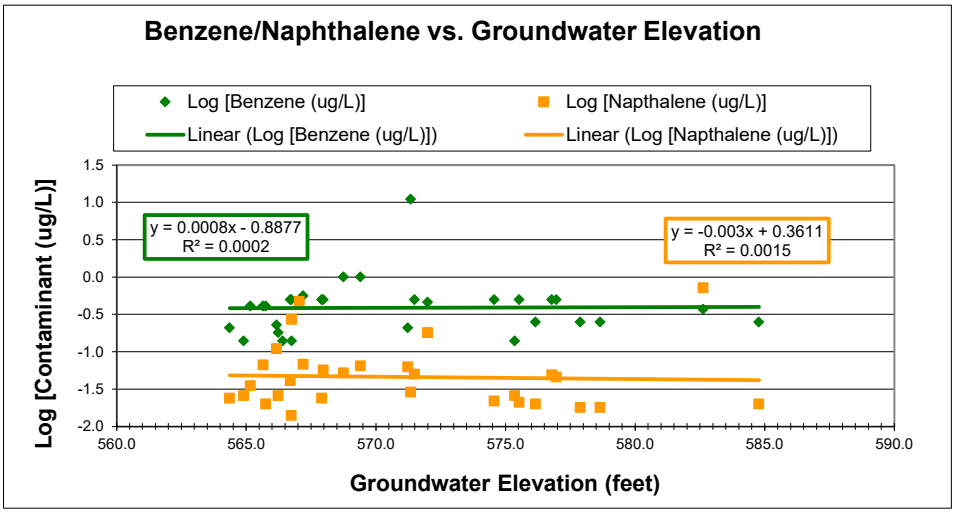

MW-411B

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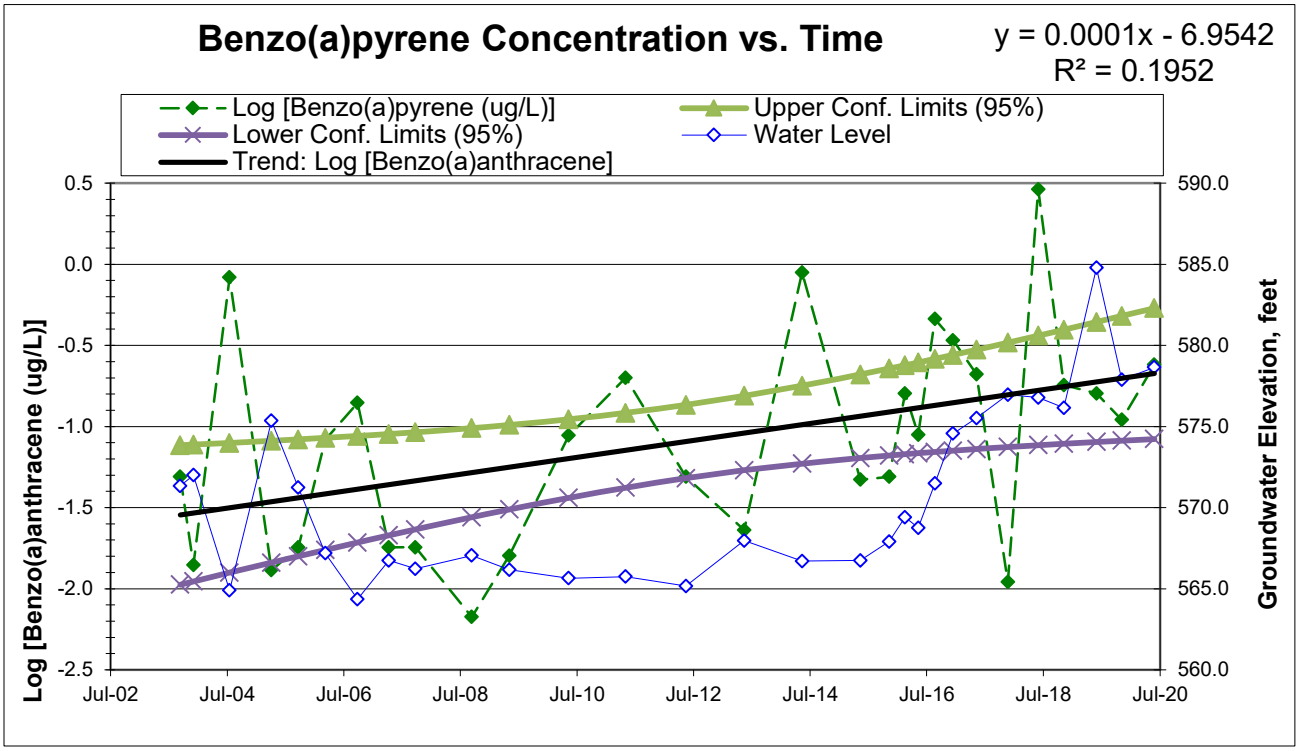
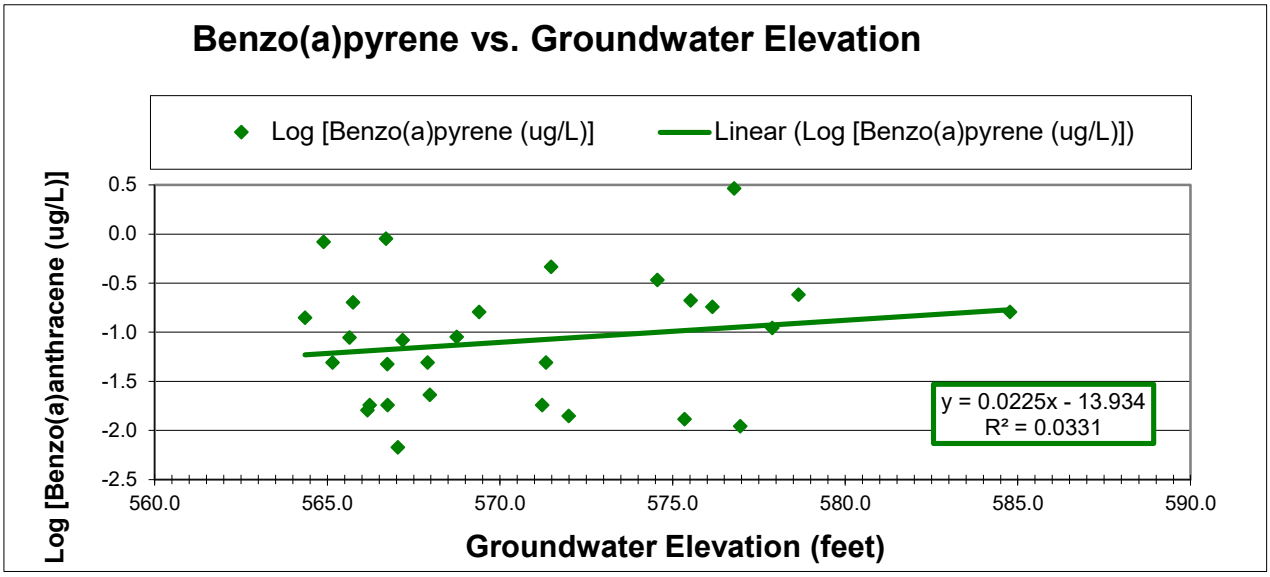
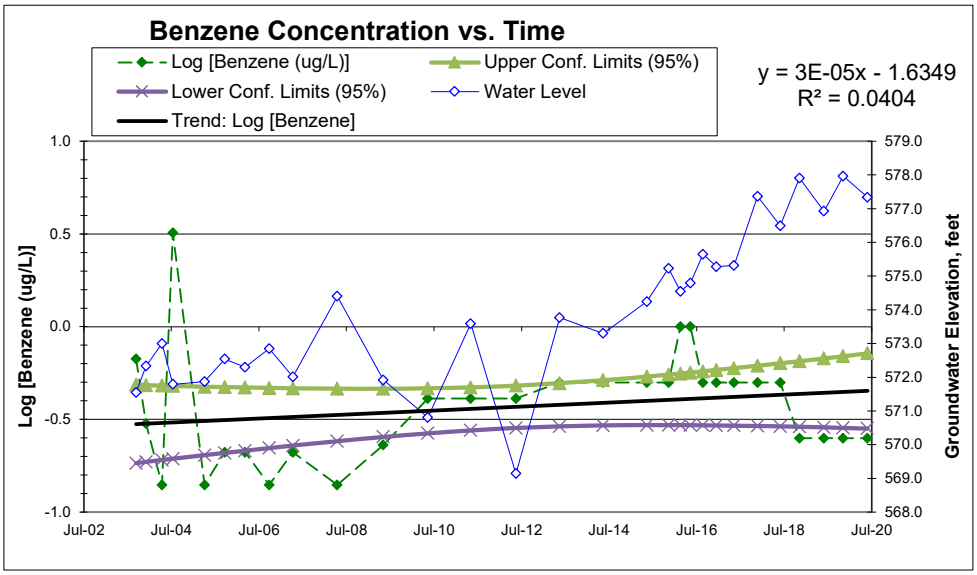
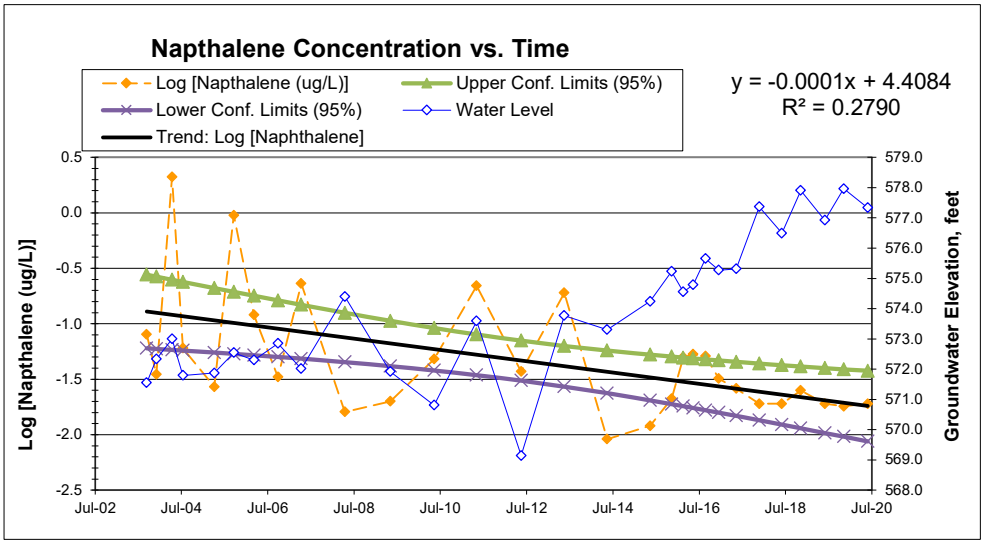


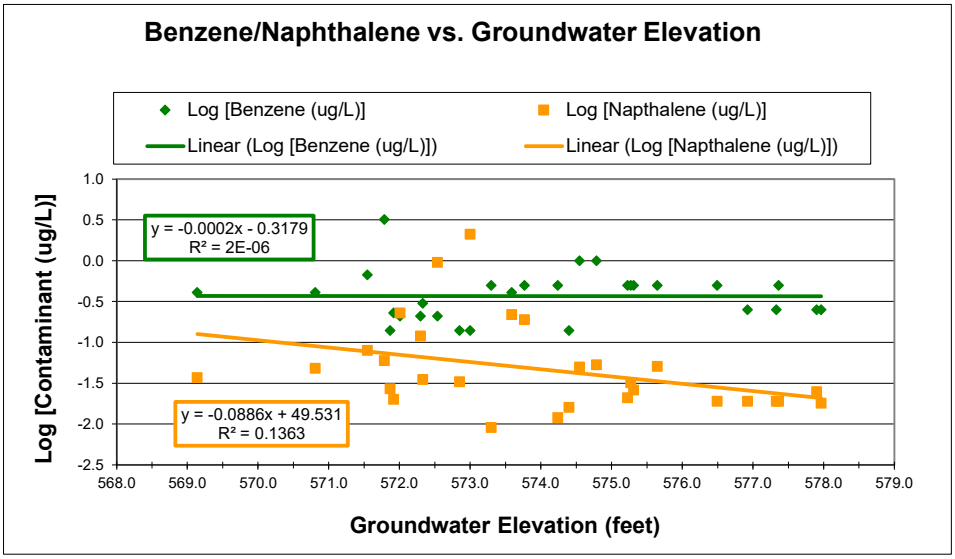


MW-415B

Former Green Bay MGP Site - Wisconsin Public Service Corporation







MW-415B

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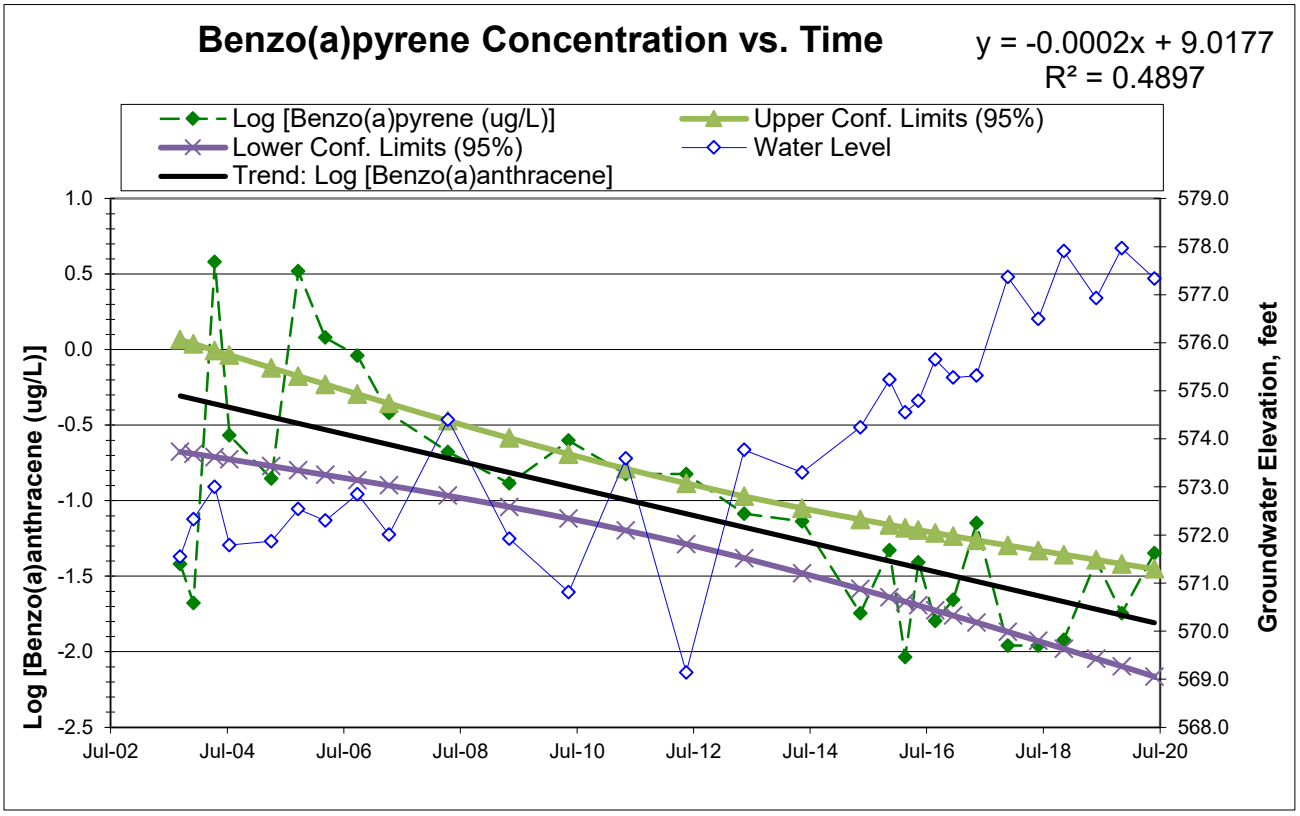

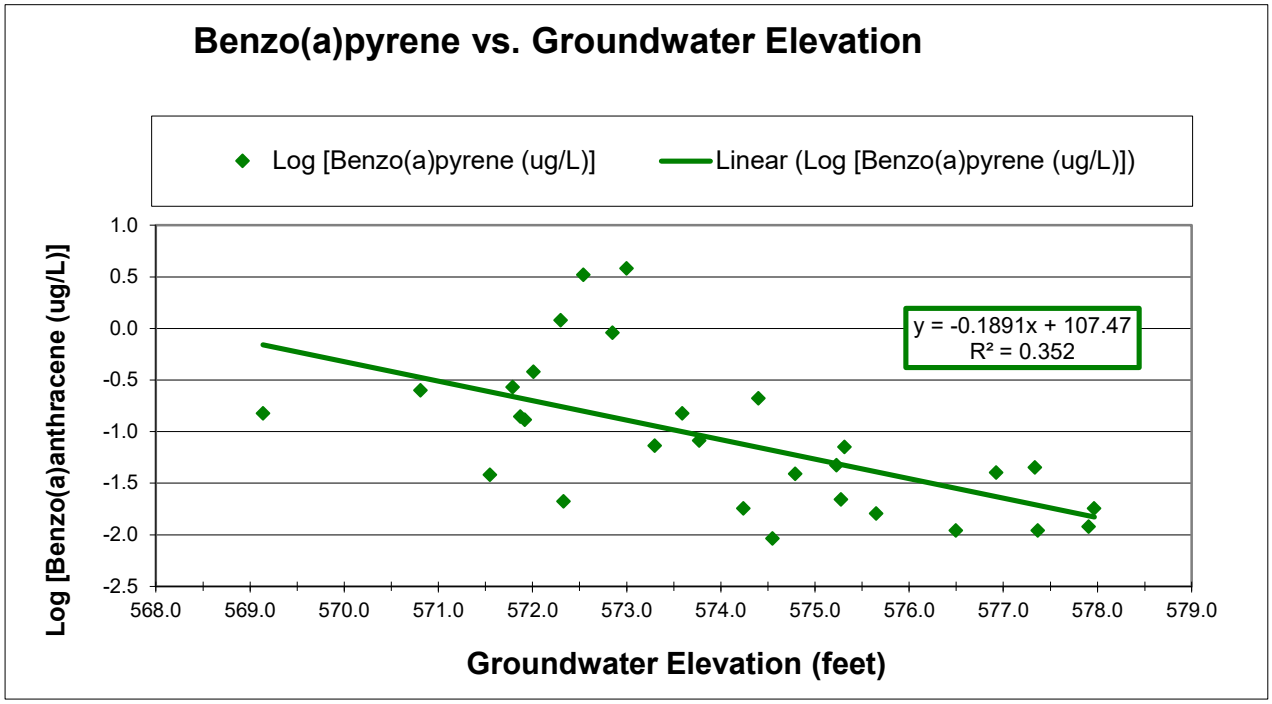

APPENDIX 3
RISK TABLES

(PROVIDED SEPARATELY AS EXCEL TABLES)