Proposed Plan for Cleanup
Wisconsin Public Service Corporation Marinette Former Manufactured Gas Plant Superfund Alternative Site
Marinette, Wisconsin

Community Participation

EPA and Wisconsin DNR provide information regarding the Wisconsin Public Service Corporation Marinette Former Manufactured Gas Plant Superfund Alternative Site to the community by participating in established community meetings, maintaining an Administrative Record for the site, and publishing announcements in the *Marinette and Menominee EagleHerald*. Through these means, EPA and Wisconsin DNR encourage the public to gain a more comprehensive understanding of the Superfund activities that have been conducted at the site. Site information can also be found on EPA Region 5's web site at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0509952.

EPA maintains the site Administrative Record, which contains the information EPA used to develop the proposed site remedy, at the following locations:

Stephenson Public Library	EPA Region 5
1700 Hall Avenue	77 W. Jackson St.
Marinette, Wisconsin	7th Floor Records Center
Hours: 9AM – 6PM	Chicago, Illinois
(715) 732-7570	M-F 8AM to 4PM

EPA will accept written comments on the WPSC Marinette MGP site's Proposed Plan during the public comment period, which **runs for a total of 30 days, from July 17—August 16, 2017.** Written comments may be sent to the following address:

Susan Pastor
Community Involvement Coordinator
United States Environmental Protection Agency
Mail Code SI-6J
77 W. Jackson Blvd. Chicago, IL 60604

1. INTRODUCTION

The purpose of this Proposed Plan is to: (1) provide background information regarding the Wisconsin Public Service Corporation Marinette Manufactured Gas Plant Superfund Alternative Site (WPSC Marinette MGP); (2) describe the various cleanup alternatives considered for cleaning up WPSC Marinette MGP site; (3) identify U.S. Environmental Protection Agency's (EPA's) preferred cleanup alternative for the site and explain the reasons for that preference; and (4) solicit public review of and comment on the alternatives evaluated.

This document is issued by EPA, the lead agency for site activities. The Wisconsin Department of Natural Resources(WDNR) is the support agency. EPA, in consultation with WDNR, will select a final remedy for WPSC Marinette MGP site after considering all comments submitted during a 30-day public comment period.

EPA encourages the public to review and comment on this Proposed Plan.

EPA's decision on the final remedy for WPSC Marinette MGP site will be announced in local newspaper notices and presented in an EPA document called a Record of Decision (ROD). EPA's final cleanup decision for the site could differ from the preferred alternative in this Proposed Plan depending on information or comments EPA receives during the public comment period, so it is important for the public to comment on all of the cleanup alternatives discussed in this document.

As described in more detail later in this proposed plan, EPA is proposing Alternative 3 as the proposed alternative to remediate non-aqueous phase liquid (NAPL) and polycyclic aromatic hydrocarbon (PAH) contamination in the soil and groundwater. Alternative 3 includes removing accessible MGP source material from soils in Boom Landing and the Wastewater Treatment Plant (WWTP) zones that are the primary contributors to the dissolved-phase plume and maintaining existing pavement and building slabs, installation of a soil barrier, and soil institutional controls. The groundwater component of Alternative 3 includes *in-situ* injection of treatment reagents in the excavated areas combined with monitoring, and controls to prevent the use of groundwater within a defined zone until groundwater cleanup goals are achieved. Soil gas resulting from contaminated groundwater will be controlled through requirements to complete additional assessment should land use change, future buildings be constructed, or existing buildings be modified. The sediment remediation component will fall under groundwater and will include added controls to restrict the removal of the reactive core mat until sufficient upland source removal has been completed. Long-term effectiveness of the reactive core mat will be documented through regular sheen monitoring and the combination of restrictions and monitoring.

The proposed measures to remediate the contaminated soil and groundwater at the WPSC Marinette MGP site would be protective of human health and the environment, would meet applicable or relevant and appropriate requirements (ARARs), would be cost-effective, and would be effective in the long term.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation (RI) Report and the Feasibility Study (FS) Report and other documents contained in the Administrative Record file. EPA and WDNR encourage the public to review these documents to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted at the site to date.

2. SITE BACKGROUND

Site Location and Description

The 4-acre former Marinette MGP property is currently owned by the City of Marinette (City) and 1428 Main Street Holdings (Figure 1). The 1428 Main Street Holdings property was previously owned by Goodwill Industries and may also be referred to as the “former Goodwill property” in this and other site-related documents. Currently, the City operates a WWTP at the property. The portion of the former MGP facility located on the 1428 Main Street Holdings property is currently a parking lot for the commercial building located on the property. The former MGP property is within 700 feet of the Menominee River. The former MGP property is bounded on the north by Mann Street and railroad tracks, on the southwest by Ludington Street, and on the southeast by Ely Street (Figure 2, below).

The approximate area of the upland portion of the site, illustrated in Figure 2, is 15 acres and includes the following properties owned by WPSC, Canadian National Railroad, Marinette

Central Broadcasting, and the City, which owns Boom Landing, the WWTP, the Fire Station, and City rights-of-way. The upland site is primarily located within heavy manufacturing and park districts; however, small portions of the site also fall within community business and waterfront overlay districts. Most of the upland site is covered with pavement, buildings, or manicured lawns.

The City has constructed a public boat launch (Boom Landing) along the Menominee River adjacent to the former MGP property where a former slough/log-run had passed through the property. The boat landing is located approximately 2 miles west from the mouth of Lake Michigan. The Menominee River, which separates Wisconsin from Michigan's Upper Peninsula, is a gaining stream that receives groundwater and surface water from the Marinette area and discharges into Lake Michigan (Green Bay). According to the bathymetric surveys, water depths near the site range from 1 to 20 feet. The river is nearly 1,075 feet wide near the site.

Site History

This section of the Proposed Plan provides the history of the site and briefly discusses the various investigations that have been conducted at the site.

MGPs were industrial facilities that were found in every sizable town or city in the U.S. from the 1820s to right after World War II. MGPs heated coal in large industrial ovens to produce manufactured gas used for street and home lighting, heating, and cooking. After the war, natural gas use replaced manufactured gas use because it was abundant, lower priced, and overall cleaner for the environment. Some MGPs continued to operate after WWII, and most ceased operations by the 1960s and were torn down. Typically, the aboveground structures, such as buildings, tar/oil tanks, and storage sheds, were demolished and the foundations were backfilled, leaving hardly any visible traces of the former operations. Belowground structures such as traces of underground piping and storage tanks, along with residual contaminants, were often left behind.

The former Marinette MGP facility was constructed between 1901 and 1910 and operated through 1960. Prior to 1903, the Marinette Lighting Company owned the former MGP property. In 1903, electric and gas utilities in Marinette, Wisconsin, and Menominee, Michigan, were merged to form the Menominee and Marinette Light and Traction Company. In 1922, WPSC acquired control of the Menominee and Marinette Light and Traction Company and operated it as a wholly owned subsidiary. In 1953, the subsidiary was merged with the parent company. In 1962, the former MGP property was sold to the City of Marinette under a land contract. The City subsequently used the property to expand the WWTP facilities.

The former MGP facility operated with two methods of coal gas production. Coal gas production from construction of the facility to 1928 was by retort, while coal gas production from 1928 to 1960 used the carbureted water gas (CWG) process. Coal tar was a valuable commodity and typically sold as a chemical feedstock and for wood treatment; the timber industry thrived in the Marinette area. Based on the location of the tar tanks adjacent to the railroad tracks, it is reasonable to presume that a significant amount of tar produced at the MGP facility was shipped offsite.

Coal gas production from construction of the facility to 1928 involved heating and volatilizing coal in an airtight chamber (retort). At retort temperatures (about 2,200 degrees Fahrenheit [^{o}F]), the coal decomposed into gas and tar. The gas was then passed through a purifier to remove impurities such as sulfur, carbon dioxide, cyanide, and ammonia. Dry purifiers used trays and sieves containing lime or hydrated iron oxide mixed with wood chips. The gas was then stored in large holders at the facility prior to distribution for lighting and heating.

Coal gas production from 1928 to 1960 used the CWG process. This process involved passing air and steam over incandescent coal in a brick-filled vessel to form a combustible gas, which was then enriched by squirting a fine mist of oil over the bricks. The gas was then purified and stored in holders prior to distribution. In 1948, propane was introduced as a fuel and used in combination with CWG to meet the demand for gas for space heating. Natural gas pipelines subsequently replaced the need for propane and manufactured gas, and the MGP in Marinette ceased operation in 1960.

The City's WWTP was originally constructed east of the former slough in 1938 and was expanded twice—approximately in 1945 and again in 1952. When the City purchased the former MGP property in 1962, it expanded the WWTP again in 1972 and 1989 to its current size.

Environmental Investigations and Response Actions

WPSC's contractor, NRT, issued a 2009 Completion Report that contains a full bibliography of the reports and summaries issued for the site. The Completion Report can be found in the Administrative Record (AR). A summary of sampling events includes the following:

- 1989 and 1991: The City of Marinette encountered MGP-affected soils during the 1989 WWTP expansion, which lead the City to contact Wisconsin DNR regarding its findings and soil investigation. Approximately 9,700 tons of affected soil, identified through visual and olfactory evidence only, were excavated and disposed of by the City at a licensed landfill.
- 1992: A more complete site investigation conducted by Robert E. Lee & Associates, Inc.
- 1994: NRT performed soil and groundwater sampling to determine lateral and vertical extent of contamination in those media.
- 1996: NRT conducted a Phase II investigation, including more soil borings and additional monitoring well installation.
- 2002: NRT conducted groundwater sampling and assessment of the municipal water source.
- 2004: NRT sampled soil and installed monitoring wells in the proposed boat-launch expansion area and along the former slough.
- 2011: Ambient sediment sampling that included poling, surface water sampling, and river bathymetry in preparation for the NTCRA.
- 2012: Implement remaining sediment sampling prior to removal action.
- 2012: Conduct upland RI fieldwork, including soil borings, installation of monitoring wells, and installation and sampling of soil gas probes.
- 2013-2015: NRT resumed semiannual groundwater monitoring efforts.

- 2012-2014: Seasonal soil vapor sampling.
- 2014: Supplemental upland RI fieldwork.
- April 2013-2015: Monitoring of the residual sand cover placed on sediment during the NTCRA.

In addition to the 1989 soil removal, in June 2004, the City began another sewer expansion project requiring additional excavation of soils on the former MGP property. Approximately 1,030 tons of MGP-affected soil were excavated and disposed of at an appropriate landfill.

From October 2012 through March 2013, WPSC conducted the NTCRA and removed approximately 14,799 cubic yards of MGP-impacted sediments down to 22.8 parts per million (ppm) Total (13) PAHs. An additional 422 cubic yards were removed for navigational purposes as part of an access agreement between WPSC and the Nestegg Marine, an adjacent property. The removal action objective was to mechanically excavate contaminated sediments in areas with total PAH concentrations and NAPL until post-dredge verification samples indicated that the remaining sediments contained Total (13) PAH concentrations less than the remedial action level (RAL) of 22.8 ppm and no visual NAPL remaining. The figure 22.8 ppm was selected because it is Wisconsin DNR's probable effects cause at which PAHs impact microorganisms (Figure 3).

Despite multiple attempts by the contractor, there were a few areas where sediment on the uneven bedrock surface could not be fully removed. This was due to multiple factors such as irregularity of the bedrock surface and the size and type of equipment used. Consequently, a total of approximately 12,250 square feet of sand (residual sand cover) with a minimum thickness of 10 inches was placed in areas where post-dredge verification samples showed residual Total (13) PAH concentrations greater than 22.8 ppm. Monitoring of the residual sand cover is discussed in the following paragraphs with other sediment sample collection and results.

Dredging progressed upland into the shoreline in areas where NAPL was observed to be present. Due to upland land use and associated space constraints, not all upland NAPL was able to be removed. Consequently, reactive core mat (RCM) was placed along the shoreline in these areas to prevent future migration of upland NAPL into the river. This RCM extends out onto the riverbed from the shoreline and covers some of the residual sediments on the irregular bedrock surface with concentrations of Total (13) PAH greater than 22.8 ppm. Upland dredging/excavation required removal and replacement of an existing sewer outfall structure on the shoreline. In this area, RCM was placed on the side slope of the upland excavation prior to backfill to prevent contamination of clean backfill adjacent to the replacement outfall structure.

Sediment removed from the river was mixed with stabilization additives on a geomembrane-lined, asphalt pad before being transported to Waste Management's Menominee, Michigan, Landfill for disposal. Debris encountered during dredging activities and from removal of the former outfall structure was also disposed of at the aforementioned landfill under a separate waste profile. Sediment contact water collected at the stabilization pad was treated on a batch basis with an onsite treatment system in accordance with the substantive requirements of the Wisconsin Pollution Discharge Elimination System (WPDES).

Remedial Investigation/Feasibility Study (RI/FS)
In August 2006, EPA and WPSC entered into an Administrative Order on Consent that required WPSC to conduct an RI/FS at the WPSC Marinette former MGP site in Marinette. WPSC completed the RI report on January 22, 2014, and completed the FS report on June 26,2017. EPA has placed both reports into the site Administrative Record.

Public Participation Activities
Since 2006, EPA conducted community interviews, created a community involvement plan, and participated in one public meeting to present the alternative selected for the Non-Time Critical Removal Action (NTCRA) of NAPL in sediments and near-shore soils.

3. SITE CHARACTERISTICS

This section of the Proposed Plan summarizes the physical characteristics and the nature and extent of contamination at the WPSC Marinette MGP site. The significant findings and conclusions from the site characterization activities completed during the RI are summarized below. Additional details are available in the WPSC Marinette MGP site RI Report.

Physical Characteristics
The regional geology of Marinette consists of sedimentary deposits with unconsolidated deposits over the top. Fill is encountered on top of these unconsolidated deposits, at or near the surface over much of the site. At locations in or adjacent to the former slough, the fill layer is as great as 18 feet thick. The fill material typically consists of fine sands with discontinuous clay, silt, and gravel. Glass, wood, brick, and concrete were also found, especially in the area of the former slough and the former MGP building locations. Within the former slough, the fill was often black in color and occasionally exhibited strong odors. In the vicinity of the former MGP facility, the fill material consists of fine sand, silt, and clay with occasional bedrock fragments and the aforementioned debris.

Beyond the immediate vicinity of the slough, glacial till deposits were found below the fill. The glacial deposits consist of fine sand, silt, and clay and may inhibit the movement of NAPL and/or groundwater. Bedrock occurs approximately 20 feet below ground surface (bgs) and appears to slope towards the Menominee River.

The Wisconsin-Lake Michigan basin contains three main aquifers, the unlithified sand and gravel aquifer, the Niagara dolomite aquifer, and the Cambrian sandstone aquifer. The sand and gravel glacial alluvium in the basin is a significant source of water. Generally, groundwater flow in the Niagara and Cambrian aquifers is north, northeast toward Lake Michigan. Recharge to the aquifers is local, and paths of movement are short.

The site groundwater is monitored in three different zones including the shallow sand wells screened at 580 feet elevation, deep sand wells screened at 555 feet to monitor the deep sand above bedrock, and the bedrock wells screened at 525 feet and monitor the shallow bedrock.

Nature and Extent of Contamination
This section summarizes the nature and extent of contamination in the soil, groundwater, and sediments of the site.

Soil and Groundwater Sampling Summary
As discussed above, from 1989 to 2015 there were significant sampling efforts site-wide. The investigations included sampling soil, groundwater, soil gas probes for total PAHs, semi-volatile organic compounds like benzene, toluene, ethylbenzene, and xylene (BTEX), and metals (Tables 1 and 2). The results are discussed in Section 5, Summary of Site Risks.

Sediment and Surface Water
Sediments are defined as materials collected in areas with standing water. The spatial distribution of PAHs in the site has been influenced by historical changes in the water level elevation associated with the former log-run/slough and geomorphology in this segment of the Menominee River.

Detailed discussions of the PAH concentrations in sediment are included in the NTCRA Completion Report and the RI Report. After the NTCRA, the majority of MGP-wastes were addressed from the sediment and near-shore areas. The NTCRA cleanup value was Wisconsin DNR's probable effects cause (PEC) of 22.8 mg/kg Total (13) PAHs. Any areas in the Menominee River over 50 mg/kg Total PAHs received a 10-inch sand cover. Near-shore areas above 50 mg/kg were covered with a reactive core mat to prevent sediment recontamination.

Conceptual Site Model
A conceptual site model (CSM) was developed for WPSC Marinette MGP site based on site characteristics and results from the RI investigations. The CSM tells the story of how and where the PAH contamination moved and what impacts such movement may have had upon human health and the environment (Figure 4 and 5).

As described in the CSM, NAPL and PAHs are the primary contaminants of concern (COCs). Site data shows that exposure to PAHs will drive risks at the site, and that the management of risks due to PAH exposure will also address risks associated with other non-PAH constituents.

The media of concern at the site are soil and groundwater. PAH-contaminated soil and groundwater both can lead to PAH exposure to future site workers. The targeted remediation areas at the site are soil and groundwater exceeding human health risk criteria.

Principal Threat Wastes
The principal threat concept is applied to the characterization of "source material" at a Superfund site. Source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contaminants to ground water, surface water or air, or acts as a source for direct exposure. EPA has defined principal threat wastes as those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

EPA has identified NAPL in the subsurface soil as the principal threat waste at the WPSC Marinette MGP site. NAPL is considered source material that contains hazardous substances, pollutants, or contaminants that act as a reservoir for the migration of contaminants to groundwater.

The PAH-contaminated soil and groundwater are reworked materials that have been mixed with water, soil and sediment throughout the site. The concentrations of PAHs at the site are considered to be low-level threat wastes because they are not highly mobile.

4. SCOPE AND ROLE OF THE ACTION

This Proposed Plan consists of a sitewide remedy to address the remaining MGP contaminants, including NAPL and PAHs, at the WPSC Marinette former MGP site. Following the 2012 NTCRA, which addressed contaminated sediment and near-shore contamination, this remedy addresses the remainder of the upland cleanup, as well as prescribes a long-term sediment monitoring routine to ensure the removal action adequately addressed sediment site risks. These upland source materials constitute principal-threat wastes at the site.

5. SUMMARY OF SITE RISKS

This section summarizes the risks to human health and the environment that are posed by the contamination.

Contaminants of Concern
As described in the generalized CSM, PAHs are the primary COCs. The available data indicate that exposure to PAHs will drive risks at the site, and that management of risks due to PAH exposure will also address risks associated with other non-PAH constituents.

Baseline Human Health Risk Assessment

The baseline human health risk assessment (HHRA) for the site was completed by the PRP's contractor, NRT, in 2014 as part of the RI. The HHRA evaluated potential current and future risks to people who may engage in recreational activities near the Menominee River

Several potential exposure pathways were described in the 2014 HHRA that are relevant to the site, as follows:

- Industrial or commercial workers
    - Incidental ingestion of soil (surface and subsurface)
    - Dermal contact with soil (surface and subsurface) as a result of soil disturbance
    - Inhalation of vapors and dusts as a result of soil disturbance
    - Inhalation of vapors as a result of vapor intrusion from subsurface soils and groundwater into commercial/industrial buildings on the Site
    - Ingestion of groundwater
    - Dermal contact with groundwater.
- Construction workers
    - Incidental ingestion of soil (surface and subsurface) and groundwater associated with excavation activities
    - Dermal contact with soil and groundwater associated with excavation activities

    - Inhalation of vapors and dust derived from soil and groundwater associated with excavation activities.
- Recreational visitors
    - Incidental ingestion of surface soil
    - Dermal contact with surface soil.
- Residents (under a hypothetical future land-use scenario, including the unlikely possibility of significant disturbance of subsurface soils)
    - Incidental ingestion of soil (surface and subsurface)
    - Dermal contact with soil (surface and subsurface) as a result of soil disturbance
    - Inhalation of vapors and dust as a result of soil disturbance
    - Inhalation of vapors as a result of vapor intrusion from subsurface soils and groundwater into a future residential building constructed on the Site.

<u>HHRA Conclusions</u>
The likelihood of any kind of cancer resulting from exposure to carcinogens at a Superfund site is generally expressed as an upper bound incremental probability, such as a "1 in 10,000 chance" (expressed as 1 x 10^{-4}). In other words, for every 10,000 people exposed to the site contaminants under reasonable maximum exposure conditions, one extra cancer may occur as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risk of cancer individuals face from other causes such as smoking or too much sun. The risk of cancer from other causes has been estimated to be as high as one in three. The potential for non-cancer health effects is evaluated by comparing an exposure level over a specified time period (such as a lifetime) with a "reference dose" derived for a similar exposure period. A reference dose represents a level that is not expected to cause any harmful effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ < 1 indicates that the dose from an individual contaminant is less than the reference dose, so non-cancer health effects are unlikely. The hazard index (HI) is generated by adding the HQs for all COCs that affect the same target organ (such as the liver). An HI < 1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, non-cancer health effects from all contaminants are unlikely. An HI > 1 indicates that site-related exposures may present a risk to human health. EPA's acceptable risk range is defined as a cancer risk range of 1 x 10^{-6} to 1 x 10^{-4} and an HI < 1. Generally, remedial action at a site is warranted if cancer risks exceed 1 x 10^{-4} and/or if non-cancer hazards exceed an HI of 1.

The HHRA for the site presented estimated cancer risks and non-cancer hazards for residential and recreational receptors exposed to surface and subsurface soils, groundwater and soil vapor, and sediments. Sediment risks were addressed through the 2012 NTCRA and detailed risk analysis can be found in the 2013 NTCRA Completion Report.

Surface soils in Boom Landing and the WWTP and surrounding properties were associated with estimated cancer risks above the risk management range under a residential scenario, but within the risk management range for an industrial scenario. Under current conditions, recreational visitors would be unlikely to be exposed to surface soils in Boom Landing, because the unpaved area is small, and the soils in this area are covered with a manicured lawn. The presence of pavement, buildings, and manicured landscaping in the WWTP and surrounding properties also results in very low potential for exposure to chemicals in soil under present conditions. If some degree of surface soil exposure were assumed for a recreational user under current conditions, the exposure frequency for a recreational visitor would be expected to be at least an order of magnitude less than that of a hypothetical resident (i.e., less than 35 days/year rather than 350 days/year), which would correspond to cancer risk estimates within the risk management range. For a construction worker, risks are anticipated to be within the risk management range, given that estimated cancer risks for the industrial worker scenario were within the risk management range, and the potential level of chemical exposure is anticipated to be similar for these two potential receptors based on Site-specific conditions. No observations of MGP-residuals in the surface soils (i.e., less than 2 ft) were documented in the RI that would present a special condition for construction workers.

Subsurface soils in Boom Landing and the WWTP and surrounding properties do not currently pose a risk to human receptors, because they are not available for contact and buildings are not present near the subsurface soil contamination. However, estimated potential risks would be above the risk management range if future construction disturbed the soil sufficiently to allow exposure similar to either a residential or a generic industrial worker scenario. Considering the results for the industrial worker and residential scenario, there is a potential for risks to construction workers or recreational visitors above the risk management range as well. Direct exposure to MGP residuals, which have been observed in the subsurface soils in this area, would also pose a potential risk above the risk management range.

Groundwater is not currently used as drinking water within the City of Marinette, and there are no known current users of groundwater for any other purpose in proximity to the Site. Based on the groundwater results, concentrations would not meet the legally enforceable standards for drinking water. There were numerous exceedances of the drinking-water standards and tap water RSLs, including benzene, ethylbenzene, xylenes, PAHs, iron, and manganese. Although the groundwater is not used as the drinking water source, the NCP's expectation is that groundwater will be restored to beneficial use. The groundwater is classified by the State of Wisconsin as a Class II drinking water aquifer; therefore, the Site groundwater needs to be restored to the Safe Drinking Water Act maximum contaminant limits (MCLs) for all contaminants of concern.

If future construction in the area would result in workers having direct physical contact with groundwater or inhaling associated vapors in excavations at or below the water table, there would be some potential for exposure to the contaminated groundwater. However, contact with groundwater is likely to be infrequent, because of safety considerations when entering excavations with standing water that are unrelated to the potential presence of chemical contamination in that groundwater. In addition, groundwater would not be encountered until a minimum of 2 ft bgs near the Menominee River, with depths more commonly ranging from 4–10 ft bgs. Intrusive work occurring at depths less than this would not result in groundwater exposure. Based on results of the RI, groundwater in specific areas of the Site may be contaminated with MGP residuals (i.e., Boom Landing and focused areas within the WWTP). If MGP residuals were encountered in an excavation by a construction worker, exposure to the groundwater would represent risks above the risk management range, due to the potential for direct contact with the MGP residuals and the inhalation of chemical vapors formed due to the presence of the MGP residuals.

Soil vapor data were screened against Vapor Intrusion Screening Levels (VISLs) obtained using the EPA's vapor intrusion screening level calculator (U.S. EPA 2014b).

- For soil vapor samples taken beneath the Vehicle Storage building in the WWTP, the majority of results were non-detect, and all chemical concentrations were below the industrial worker VISLs, and thus associated with risks below the risk management range. All but one sample was also below residential VISLs, and the estimated risk for a hypothetical residential scenario for this one sample was at the low end of the risk management range.
- For soil vapor samples collected directly beneath the Service Building, all results were below industrial VISLs, and thus associated with risks below the risk management range. The estimated cancer risks for soil gas samples under a hypothetical residential scenario were within or below the risk management range. One sample had a noncancer hazard (2) above the risk management criterion. For exterior soil gas samples near the Service Building, estimated risks for either a hypothetical future industrial building or a residence were within the risk management range.
- For soil vapor samples collected in Boom Landing where inhabited buildings do not exist at present, estimated risks for either a hypothetical future industrial building or residence were estimated to be within the EPA's risk management range.
- For soil vapor samples collected in the WWTP area in areas where no buildings currently are present, estimated risks for either a hypothetical future industrial building or residence were within the risk management range except for a single location (SG05). Considering, collectively, the results of the soil vapor sampling that was performed onsite, if construction workers performed maintenance or redevelopment activities involving excavations, the air quality in the excavation would not be expected to pose a health concern due to chemical concentrations in air. Based on the low concentrations of COCs in soil vapors other than in an isolated location in the WWTP area, the concentrations of chemicals in air inside an excavation would be expected to be low as well, considering the amount of dilution that would occur when soil vapors are mixed with ambient air, as long as MGP residuals are not encountered. As pointed out earlier in this report, if MGP residuals are encountered in excavations, soil vapor concentrations would potentially result in risks above the risk management range.

<u>The HHRA concluded the following:</u>

- Surface soils in Boom Landing and the WWTP were estimated to be associated with risks within the risk management range for an industrial worker, a construction worker, or for the limited exposure of a recreational visitor. Estimates for a hypothetical resident were above the risk management range.
- Subsurface soils on the Boom Landing and WWTP properties do not currently pose a risk to human receptors, because they are not available for contact, but under the assumption of potential future exposure to these soils, estimated risks are above the risk management range for all receptors

Groundwater at the Site is not used as a drinking water source as a result of numerous exceedances of the drinking water standards. However, groundwater is classified as a Class II aquifer, meaning the water is potable and must be restored to Safe Drinking Water Act maximum contaminant limit standards for contaminants of concern. Additionally, if future construction in the area would result in workers having direct physical contact with groundwater or associated vapors in excavations at or below the water table, there would be some potential for risks above the risk management range due to the presence of MGP residuals.

For soil vapor underneath the WWTP Vehicle Storage building, estimated risks were within the risk management range under a residential scenario, and no COCs were identified under an industrial scenario.

 For soil vapor samples collected directly beneath or near the Service Building, all results were within or below the risk management range under an industrial scenario. Under a hypothetical residential scenario, one sample had a noncancer hazard above the risk management criterion.

For soil vapor samples collected in Boom Landing or the WWTP in areas where no buildings currently are present, estimated risks for either a hypothetical future industrial building or residence were within the risk management range except for a single location in the WWTP (SG05).
 Construction workers exposed to soil vapors in excavations are not expected to be exposed to chemical concentrations in air above the risk management range unless MGP residuals are encountered.

Prior to the sediment Removal Action that occurred in the Menominee River, surface water samples were collected to evaluate if contaminated sediments were impacting the water quality. The surface water quality was not found to pose a health concern to either human or ecological receptors based on screening assessments performed on these data; further, the sediment Removal Action would have improved the current water quality.

Prior to the sediment Removal Action, there were localized areas of surface sediments that were estimated to pose a risk to sensitive ecological receptors.

In these areas, water depth would generally minimize the potential for human exposure to the sediments. These sediments have been removed to the extent practical. A small area where bedrock prevented further dredging has been covered with 10 in. of sand. Because of this Removal Action and the placement of the sand cover, human and ecological receptors under current conditions do not have the potential for exposure to MGP-affected sediments. Following 2 years of monitoring, results of sand cover sampling meet the conditions for monitoring to cease until the 5-year review, as described in the approved residual sand cover monitoring plan.

Baseline Ecological Risk Assessment

As part of the RI, NRT prepared a baseline ecological risk assessment (BERA) that identified terrestrial and aquatic receptors and exposure pathways.

<u>Summary of the BERA</u>

The BERA was conducted to evaluate potential adverse effects aquatic ecological receptors associated with PAH exposures in surface water and sediment of the Menominee River.

The ecological screening evaluation of the Menominee River sediments collected during the RI showed that total PAH concentrations were elevated above the generic screening level benchmark or PEC of 22.8 mg/kg. The PEC was used as a conservative screening tool. There were also isolated exceedances of metals above their PEC, but these exceedances did not appear to be related to the former MGP operations as they were, for the most part, in different locations than the total PAH exceedances. There was a focused area of sediment contamination near the boat ramp and the marina that was above the generic total PAH PEC. During the RI, sediment samples were also collected to perform Site-specific toxicity testing to develop total PAH concentration limits using testing methods and statistical evaluations similar to those performed at other Integrys sites (i.e., Campmarina, Manitowoc) that would be protective of ecological receptors. Prior to completion of the RI, Integrys decided to perform a time-critical Removal Action of MGP-affected sediments in the River. The decision was made to use the total PAH PEC as the remedial action level to define the area of sediments to be removed. The remediation successfully removed most sediments with concentrations above the remedial action level. Sediments with total PAH concentrations above the remedial action level remained at three isolated locations outside of the footprint of the remediation (refer to Sheet 4 in the RI report). Two of these locations had concentration only slightly above the remedial action level and the third had an anomalously high concentration of total PAHs, as indicated by the confirmation sample that had a total PAH concentration below the remedial action level. Site-specific sediment toxicity testing, described below, yielded a total PAH concentration limit that would be protective of sensitive ecological receptors, which was higher than the conservative remedial action level of 22.8 mg/kg that was used to guide the limits of the sediment remediation. Because the Site-specific sediment toxicity testing was not used to refine the total PAH concentration limit for guiding the remediation, a larger area of sediments were removed than would have been required if the sediment toxicity results had been considered.

The results of the Site-specific sediment toxicity testing showed that the lowest concentration of total PAHs that resulted in a statistically significant decrease in survival of the test organism (the amphipod *Hyalella azteca*) was 61 mg/kg, which is well above the remedial action level of 22.8 mg/kg. Based on further statistical analyses, this concentration limit was selected as the upper limit of the no significant risk zone. With the exception of the anomalously high sediment sample, the total PAH sediment concentrations remaining in the river after the remediation are all below this concentration limit of 61 mg/kg. Thus, the sediments remaining in the Menominee River do not pose a risk to sensitive aquatic ecological receptors (e.g., benthic invertebrates). Some areas of the river where pockets of sediment within the undulating bedrock surface contained total PAHs above the remedial action level of 22.8 mg/kg that could not be completely removed were covered with a 10-in. layer of sand to manage dredge residuals. Total PAH concentrations in and just below the sand have been sampled as part of a post-remediation monitoring program. Based on the results of four rounds of post-remediation monitoring sampling, the concentrations of total PAHs in the surface sand cover material are below the remedial action level and do not pose a risk to sensitive ecological receptors, such as benthic invertebrates. These results meet the conditions for sand cover sampling to cease until the 5-year review, as described in the approved residual sand cover monitoring plan.

Basis for Taking Action

It is EPA's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

6. REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are goals for protecting human health and the environment. RAOs are developed to address the contaminant levels and exposure pathways that present unacceptable current or potential future risk to human health and the environment. The development of RAOs and proposed cleanup levels, known as preliminary remediation goals (PRGs), is the first step in identifying and screening remedial alternatives for addressing the COCs and media of concern.

Remedial Action Objectives

The following four RAOs have been developed for PAHs-containing media in the site:

Remedial action objectives (RAOs) describe goals that the proposed remedial action is expected to accomplish. RAOs for the site were developed to protect human health and environmental receptors from unacceptable risk resulting from former MGP operations at the site. A RAO provides a basis to evaluate the process options discussed in Section 3 and the remedial alternatives evaluated in Section 4. RAOs for the site were developed to protect human health receptors from unacceptable risk resulting from former MGP operations at the site. The RAOs address current and reasonably anticipated future land use.

- Soil/Soil Vapor
    - RAO-1 – Prevent human exposure (dermal, as well as incidental ingestion of particulates and vapor) to NAPL-saturated soil and subsurface soil containing MGP-related contaminants greater than PRGs
- Groundwater
    - RAO-2 – Prevent human exposure, including dermal contact, ingestion, and inhalation (as a result of vapor intrusion) of groundwater containing MGP residuals exceeding the PRGs.
    - RAO-3 – Restore groundwater to **P**RGs for MGP-related contaminants within a reasonable timeframe.
    - RAO-4 – Minimize, to the extent practicable, the potential for migration of groundwater with MGP-related constituents above the PRGs to surface water.
- Sediment
    - RAO-5 – Demonstrate that the RCM remains effective at preventing NAPL from migrating into the Menominee River.

Preliminary Remediation Goals

PRGs are risk-based or ARAR-based chemical-specific concentrations that help further define the RAOs. PRGs are considered "preliminary" remediation goals until a remedy is selected in a ROD. The ROD establishes the final remedial goals and/or cleanup levels. PRGs are also used to define the extent of contaminated media requiring remedial action, and are the targets for the analysis and selection of long-term remedial goals.

The HHRA developed a series of risk-based concentrations (RBCs) for total PAHs intended to be protective of future workers. The RBCs are calculated, chemical-specific concentrations below which no significant health effects are anticipated for a receptor. For human receptors, the site RBCs correspond to a target risk for carcinogenic effects of 1×10^{-6} and a target HI of 1 for non-carcinogenic effects. For ecological receptors, RBCs correspond to a target HQ of 1. RBCs for ecological receptors represent a risk range based on "No Observed Adverse Effects Level" and "Lowest Observed Adverse Effects Level" risk estimates for each receptor group.

The proposed Remediation Goals (RGs) for soil are generally based on EPA default exposure parameters and factors representing reasonable maximum exposure conditions for long-term/chronic exposures for cancer risk of 10^{-6} with a corresponding hazard quotient of 1 under a hypothetical residential and industrial exposure scenario. Remediation to residential PRGs will result in unrestricted use and unrestricted exposures. Remediation to industrial RGs will be protective, if there are corresponding controls to prevent residential land use, unless additional remedial action is undertaken (Table 1). As specified by Wisconsin DNR's Update to RR-890 and RCL Spreadsheet (Wisconsin DNR, June 2014), certain EPA default exposure parameters were modified to match current Wisconsin DNR requirements. The PRGs were developed based on the most recent toxicity values included in the EPA November 2015 Regional Screening Level web calculator.

During implementation of a remedy, flexibility will be provided to modify the above PRGs by conducting a post-remedy risk assessment following the risk assessment framework as negotiated in the 2006 Order on Consent. If the post-remedy risk assessment concludes cumulative site risk is below the target cancer risk and noncancerous hazard index for the targeted exposure scenario, then no additional remedial action will be required.

Table 1: Soil Remediation Goals

Constituents of Concern	Minimum to Maximum Range in PPM	CR>1×10-6; HQ>1 in PPM
Ethylbenzene	ND-288	37
Benzo(a)pyrene	ND-534	2.1
Naphthalene	ND-1630	26

*PPM=Parts per million
*ND=non-detect; a value below detection limits

Groundwater Remediation Goals

EPA Tap-Water regional screening levels are a screening tool and are not appropriate or enforceable cleanup levels. Therefore, the selected groundwater RGs will be based on enforceable federal or state groundwater standards (Table 2). For groundwater at the site, the RGs will be the more conservative of Wisconsin NR 140 Groundwater Enforcement Standard (NR 140) or the National Primary Drinking Water Regulations Maximum Contaminant Level as presented in the Multi-Site Risk Assessment Framework Addendum Revision 3 (Exponent, July 2014, found in the AR).

Table 2: Groundwater Remediation Goals

Contaminant of Concern	Minimum to Maximum Range in μg/L	PRG in μg/L	Basis for PRG
Benzene	ND-580	5	MCL and NR140
Ethylbenzene	ND-1,700	700	MCL and NR140
Benzo(a)pyrene	ND-80	0.2	MCL and NR140
Benzo(b)fluranthene	ND-45	0.2	NR140
Chrysene	ND-59	0.2	NR140
Naphthalene	ND-3,200	100	NR140

*μg/L= micrograms per liter *ND = Non-Detect, or below detection levels

7. SUMMARY OF REMEDIAL ALTERNATIVES

A range of alternatives was developed for soil and groundwater to achieve the site RAOs. Remedial alternatives were developed by assembling combinations of appropriate remedial technologies. The WPSC Marinette MGP site remedial alternatives are described below and summarized on Table 4. Additional details about all the remedial alternatives are available in the site FS Report.

EPA is recommending that Alternative 3 be selected as the remedy for the site.

Remedial Alternatives

1: No Action
Regulations governing the Superfund program require that the "no action" alternative be evaluated generally to establish a baseline for comparison. The No Action remedial alternative, 1, would rely on natural recovery processes for soil and groundwater. No active remediation or monitoring would be conducted under this alternative. The time to reach protective levels and compliance with PRGs is estimated to be a minimum of 100 years, but no monitoring would be conducted to document progress toward achievement of PRGs. No cost is associated with this alternative.

2: Soil Excavation and Disposal at Boom Landing, Engineered Barriers over affected Surficial Soils, In-situ Treatment of Affected Groundwater, Institutional Controls, and Long-Term Monitoring
This alternative includes excavation and Offsite Disposal of Accessible Boom Landing Source Material, and installation/maintenance of horizontal engineered barriers over affected surficial soil, *in-situ* treatment of affected groundwater, effectiveness monitoring of the sediment RCM, and institutional controls to manage potential risks associated with soil, groundwater, soil gas, and sediment The long-term monitoring program for recovery would be robust to confirm stability of PAHS deposits and to measure and track recovery of PAH-impacted media in soil and groundwater. The time to reach protective levels and compliance with PRGs under Alternative 2 is estimated to be 35-115 years after ROD issuance. The estimated cost of this alternative is $6,870,000 based on a present worth of 7%.

Soil – Accessible Boom Landing Source Material Excavation and Offsite Disposal

The RI report documented two distinct locations of source material within the Boom Landing Zone. The Boom Landing Zone – Southern Source Area is located near the entrance of Boom Landing Parking Lot from Mann Street, where source material was identified between 6 feet and 11 feet bgs over approximately 1 acre. The Boom Landing Zone – Northern Source Area is located immediately upland of the Menominee River, where source material was identified between 6 feet and 17 feet bgs over approximately 0.4 acre. Boom Landing Zone – Southern Source Area is also the location of the most highly affected groundwater well (MW311), and removal of the source material is expected to improve long-term groundwater quality. Groundwater monitoring wells within the Boom Landing Zone – Northern Source Area have indicated that the minimal amount of source material present has not resulted in elevated detections of MGP-COCs in groundwater. In addition, material in this location was removed to the extent practical during the sediment removal action. Following the sediment removal action, inaccessible material (primarily historical debris) remained and was covered by an RCM to manage the minimal potential risk from limited source material within the debris. Therefore, additional removal of the Boom Landing Zone – Northern Source Area is considered impractical and was not be evaluated. Presumptive major elements of source material excavation include the following:

- Completing predesign investigation to further define horizontal and vertical extent of excavation and provide waste characterization sampling
- Obtaining access agreements and demolition/removal of the parking lot, fish house, utilities, and existing concrete and asphalt pavements in the Boom Landing Zone
- Installing temporary shoring, as necessary to support deeper excavations
- Installing a temporary dewatering system to lower the water table within the excavation footprint
- Excavating non-affected overburden soil and stockpiling onsite for use as post-excavation backfill
- Excavating MGP-source material and transporting to a Subtitle D Landfill
- Backfilling excavation to surrounding grades with granular backfill and stockpiled overburden material
- Restoring the site to previous conditions

To reach the vertical extent of source material at the Boom Landing Zone, excavation below the water table is required. Temporary shoring and dewatering will likely be necessary to support the proposed excavation activities. Conceptually, water will be extracted from the excavation using trash pumps. Extracted water will undergo pretreatment (particle separation and adsorptive media filtration) prior to discharge to the City of Marinette WWTP. Alternative disposal approaches, including surface water discharge through a WPDES permit, and offsite disposal will also be considered. The exact method of water management will be determined during the remedial design stage of the project.

Constructability issues related to limited surface area of soil requiring excavation, proximity of the critical subsurface infrastructure (City of Marinette WWTP effluent pipe), granular soil, and depth of excavations extending to approximately 11 feet bgs will complicate excavation. Analysis of information collected from the predesign investigation may indicate that excavation of a portion of the material located in the Boom Landing Zone – Southern Source Area is impracticable. If excavation of source material is found to be impractical, the remedial design will include contingency measures to limit to mobility of any source material that cannot be completely removed.

Soil – Horizontal Engineered Surface Barrier – Boom Landing Zone

The Boom Landing Zone is located in an area with many surface improvements, including paved parking lots and paved roadways. Alternative 2 will involve monitoring and maintaining existing surface barriers, which currently mitigate potential exposure to surficial soil containing COCs above the PRGs. In areas of the site where human exposure to surficial soil containing COCs above the Residential PRGs is not currently limited by an existing barrier, a barrier will be installed. Conceptually, barrier installation would consist of excavating the top 2 feet of affected soil and backfilling the excavation with 18 inches of clean fill and 6 inches of clean topsoil. Alternative barrier approaches, including gravel or asphalt, will be evaluated during the remedial design phase of the project and will in part consider the preference of the property owner, in consultation with EPA and Wisconsin DNR. Based on information gathered during the RI, Figure 8 presents the approximate location where barrier installation will be required.

Predesign investigation will be conducted to refine the extent of the horizontal barrier.
In addition, the predesign investigation will include a visual survey to determine the adequacy of existing barriers.

The process through which the adequacy of existing barriers is assessed will be further refined in the remedial design. Conceptually, parking lots and sidewalks in good condition (well-maintained with minimal cracking) will be considered adequate. If an existing surface barrier is in poor condition and not providing suitable direct-contact protection, the remedial design will involve either repair of the surface to provide sufficient direct contact protection or replacement with an adequate soil barrier. Predesign sampling may be completed in areas lacking an adequate existing barrier to better-delineate the extent of surficial soil requiring a barrier. Both existing surface improvement, as well as newly installed barriers, will be regularly inspected and maintained based on the requirements of the Soil Cover Monitoring and Maintenance Plan, to be developed during the remedial design. Modification to the existing and newly installed barriers will be managed through the Soil Management Plan and corresponding institutional controls.

Soil – Horizontal Engineered Surface Barrier – WWTP Zone

The WWTP Zone is located in a developed area with many surface improvements, including WWTP process units, buildings, paved parking lots, paved roadways, and railroad tracks. Many of these surface improvements currently mitigate potential exposure to surficial soil with PRG exceedances. Alternative 2 will involve initial survey, monitoring, and maintaining existing surface improvements that are currently successful at limiting human exposure to soil containing COCs above the PRGs. In areas of the site where human exposure to surficial soil containing COCs above the PRGs is not currently limited by an existing surface improvement, a surface barrier will be installed. Conceptually, barrier installation would consist of excavating the top

2 feet of affected soil and backfilling the excavation with 18 inches of clean fill and 6 inches of clean topsoil. Alternative barrier approaches, including gravel or asphalt, will be evaluated during the remedial design phase of the project and will in part consider the preference of the property owner, and will be in consultation with EPA and Wisconsin DNR. Aerial photography was reviewed to identify site improvements that are likely to act as a barrier (WWTP process units, buildings, roads, etc.). The total surface area of the surface improvements was subtracted from the total horizontal barrier area to provide an estimate of the surface that likely requires a newly installed barrier.

Predesign investigation will be conducted to refine the extent of the horizontal barrier.
In addition, the predesign investigation will include a survey to determine the adequacy of barriers. The process through which the adequacy of existing barriers is assessed will be further refined in the remedial design. Conceptually, all settling tanks, clarifiers, and other WWTP process units and supporting buildings with a concrete slab will be considered effective barriers at mitigating exposure. Similarly, roadways, parking lots, and sidewalks in good condition (well-maintained with minimal cracking) will be considered adequate. If an existing surface improvement is in poor condition and not providing suitable direct-contact protection, the remedial design will involve either repair of the surface improvement to provide sufficient direct-contact protection or replacement with an adequate soil barrier. Predesign sampling may be completed in areas lacking an adequate existing barrier to better-delineate the extent of surficial soil requiring a barrier. Both existing surface improvement, as well as newly installed barriers, will be regularly inspected and maintained based on the requirements of the Soil Cover Monitoring and Maintenance Plan, to be developed during the remedial design. Modification to the existing and newly installed barriers will be managed through the Soil Management Plan and corresponding institutional controls.

Groundwater – *In-situ* Treatment

Alternative 2 will involve introduction of chemical reagents to degrade COCs in groundwater. The two major categories of reagents typically used for *in-situ* groundwater treatment are biostimulants and chemical oxidants. Biostimulants typically include carbon, nitrate, sulfate, and/or oxygen. Biostimulants are introduced to the subsurface to enhance biological degradation of COCs. Chemical oxidants typically include ozone, hydrogen peroxide, sodium persulfate, and permanganate. Chemical oxidants are introduced to the subsurface to oxidize COCs into inert or less toxic compounds.

For FS-level analysis, chemical oxidation was selected as the presumptive method of *in-situ* treatment of affected groundwater. Chemical oxidation was selected because it is generally more affected at addressing any potential MGP source that may not be fully removed through excavation activities. A hydrogen-peroxide-based chemical oxidant was selected as the presumptive oxidant for FS-level analysis and cost-estimation purposes. This selection was made based on the proven ability of hydrogen peroxide to address the COCs, as well as any potential remaining source material. It is assumed that hydrogen peroxide would be catalyzed by the simultaneous injection of ferrous iron to improve the oxidation potential, thereby improving the performance of the *in-situ* chemical oxidation system. Other oxidants, such as ozone, sodium persulfate, or permanganate, may be considered during the design phase.

In-situ chemical oxidation for remediation of groundwater is typically performed by overlapping pressurized injection of oxidizing agents within the delineated plume. Overlapping pressurized injections on approximately 25-foot transects will be used to address the groundwater plume on the WWTP property. However, the excavation on the Boom Landing Zone Source material will provide temporary access to affected groundwater. Introduction of oxidant into backfill material prior to backfilling the excavation will reduce costs associated with chemical injection and improve the uniformity of oxidant distribution.

In-situ chemical oxidation will target the desired treatment interval; however, *in-situ* chemical oxidation reactions can result in the generation of off-gases, primarily carbon dioxide, so a passive or active ventilation system will be required for vapor emissions mitigation.

<u>Presumptive elements of *in-situ* groundwater treatment include the following</u>:

- Performing a predesign investigation to further define horizontal and extent of affected groundwater, and collecting samples for bench-scale testing.
- Performing bench-scale testing of site soils and groundwater with varying types and percentages of reagents to determine the most effective oxidant to address COCs in groundwater and overcome the natural soil oxidant demand.
- One-time placement of oxidant into the exposed saturated zone resulting from excavation of Boom Landing Zone Source Area. It is estimated that approximately 12 pounds of oxidant per square yard of excavation bottom will be required, resulting in an estimated 25,000 pounds of oxidant in the Boom Landing Zone Area.
- Installation of permanent injection wells using direct-push technology in the WWTP Zone. Injection wells are anticipated to be constructed using Schedule 80 chlorinated polyvinyl chloride. Wells will be installed in a transect pattern within the delineated benzene and naphthalene plume, resulting in approximately 100 injection points. Due to the relatively low concentration of benzo(a)pyrene in recent groundwater sampling events (plume centerline well average of 3.2 micrograms per liter, compared to a PRG of 0.2 micrograms per liter), injections are not warranted, and natural attenuation processes will be relied on to achieve PRGs.
- Installation of permanent vapor extraction wells using direct-push technology. Approximately 25 vapor extraction wells are anticipated to be constructed using Schedule 80 chlorinated polyvinyl chloride throughout the treatment area.
- Injection of catalyzed hydrogen peroxide solution, matching the target concentration determined during the bench-scale task. For FS-level cost-estimating purposes, it is estimated that approximately 400,000 pounds of 34 percent hydrogen peroxide solution will be required to fully remediate the groundwater plume over an estimated two injections events. Injection events will be spaced at approximately 2 years to allow for completion of quarterly groundwater sampling to highlight areas where addition oxidant injection is required.
- Frequent monitoring of subsurface soil, groundwater, and vapor to assess oxidant performance and provide information to guide modifications to injection procedures.
- Injection well abandonment and restoration of site to surrounding grades.

It is anticipated that injection and monitoring activities will continue for approximately 5 years to reduce COCs to the selected PRGs.

Sediment – Monitoring

A RCM was installed along the shoreline of the Menominee River extending approximately 50 feet into the river between the western end of the WWTP Outfall and the western end of the Boom Landing Boat Launch. The purpose of the RCM was to reduce the potential for limited NAPL potentially present along the shoreline to migrate into the Menominee River and re-contaminate the recently completed sediment remediation. Groundwater monitoring of wells immediately adjacent to the RCM (MW01R and MW312) was completed following the sediment removal action, and concentrations have not exceeded groundwater PRGs. The clean groundwater samples from wells adjacent to the RCM provide a line of evidence regarding the relatively minimal magnitude and mobility of potential source material in this area.

For the purpose of providing long-term monitoring of the ongoing effectiveness of the RCM, Alternative 2 includes regular effectiveness monitoring. Monitoring will be completed in the warm-weather months (Between May and October). Warm-weather months reduce the viscosity of potential source material and increase the potential ebullition. Monitoring will be completed annually for the first 5 years before transitioning to every fifth year to coincide with the Five-Year Review.

Monitoring will consist of visual observations of surface water for the presence of sheen. Visual monitoring of surface water will be completed and presence or absence of sheen will be documented via photographs and logbooks. If sheen is identified, there is potential that sheen would be resulting from the adjacent marina, boat launch, and WWTP outfall; therefore, if sheen is observed, an evaluation regarding the likely source of the sheen will be conducted. In addition, shoreline monitoring wells will be monitored for the presence of sheen or DNAPL and will be sampled for laboratory analysis groundwater COCs. If persistent sheen attributable to the ebullition of MGP source material is identified, additional remedial action will be evaluated based on the degree of the sheen observed.

Soil, Groundwater, Soil Gas, and Sediment – Institutional Controls

Following removal of accessible source material within the Boom Landing Zone, potential risks resulting from exposure to remaining source material, soil, groundwater, sediment, and soil gas will be managed through institutional controls. The boundary for institutional controls will be based on delineation of MGP-COCs on affected parcels to residential PRGs. For the purposes of this FS, Wisconsin DNR' s Geographic Information System (GIS) Registry will be used to implement institutional controls; however, alternate continuing obligation mechanisms, including deed restrictions, may be considered as part of the remedial design. Requirements, limitations, or conditions relating to restrictions of sites listed on the Wisconsin DNR GIS database are required to be met by all property owners [Wisconsin Statutes Section 292.12(5)]. As a result, the statute requires that the GIS database conditions be maintained for a property, regardless of changes in ownership. A violation of Section 292.12 is enforceable under Wisconsin Statutes Sections 292.93 and 292.99.

In addition, approximately 15 acres will be subject to restrictions using the Wisconsin DNR GIS Registry. Specific restrictions that will be included on the Wisconsin GIS Registry for these properties will include the following:

- **Soil –** Any subsurface activity must be conducted in accordance with a Soil Management Plan to ensure proper management of subsurface soil disturbed through future site development, utility repairs, and other intrusive activities.
- **Soil Gas/Vapor Intrusion –** Vapor intrusion risks must be reassessed should any of the following conditions be satisfied: (1) Modification of land use; (2) Construction of a new building; (3) Modification to existing buildings that may negatively affect the vapor intrusion pathway.
- **Groundwater –** Construction of potable water wells and consumption of groundwater will be prohibited.
- **Sediment –** Removal of RCM and overlying riprap must be completed in accordance with a Soil Management Plan.

Groundwater – Plume Stability Monitoring

The past 10 years of groundwater monitoring have documented the plume to be relatively stable in both concentration and location. This stability of the groundwater plume is expected to be enhanced following removal of the Boom Landing Zone – Southern Source Area.
Following source material removal, diffusion of contaminant mass sorbed within natural organic material within the saturated soil combined with low PRGs make it unlikely that groundwater will naturally attenuate to PRGs in a reasonable time. Alternative 2 will involve monitoring of groundwater quality from the current monitoring network of 14 wells to verify that the extent of the institutional controls is sufficient. Exceedances downgradient of the current plume extent may trigger additional remedial action to prevent migration of affected groundwater into the Menominee River. For the purposes of this proposed plan, it is assumed that plume stability monitoring will occur semiannually for the 30-year analysis period. Based on results of the first rounds of monitoring, WPSC may submit requests to reduce the frequency, wells included, and/or parameters analyzed in subsequent monitoring events.

3: Soil Excavation and Disposal at Boom Landing and WWTP, Engineered Barriers over affected Surficial Soils, In-situ Treatment of Affected Groundwater, Institutional Controls, and Long-Term Monitoring

Alternative 3 are excavation and Offsite Disposal of Accessible Boom Landing Source Material, and Accessible WWTP Material, installation/maintenance of horizontal engineered barriers of affected surficial soil, *in-situ* treatment of affected groundwater, effectiveness monitoring of the sediment RCM and institutional controls to manage potential risks associated with soil, groundwater, soil gas, and sediment

The long-term monitoring program for this alternative includes visual inspections, of the RCM and sediment sampling. This alternative would reach PRGs 35-110 years after ROD issuance. The estimated cost of this alternative is $7,630,000based on a present worth of 7%.

Alternative 3 includes many of the same components as Alternative 2. Only components unique to Alternative 3 and/or significantly different in implementation are presented in detailed in the following subsections. For purposes of FS-level analysis of Alternative 3, the extent of institutional controls in both the WWTP and Boom Landing Zones is based on comparison against residential soil PRGs. The extent of horizontal engineered barrier on the Boom Landing

Zone included as part of Alternative 3 will also be based on residential PRGs. The extent of horizontal engineered barrier on the WWTP Zone included as part of Alternative 3 will be based on industrial PRGs, and institutional controls will be relied upon to ensure that zoning of the WWTP Zone is maintained as industrial

Soil - Accessible WWTP Source Material Excavation and Offsite Disposal

The RI report documented two distinct locations of source material within the WWTP Zone. The WWTP – Southern Source Area is located within the former log run between the Service Building and Aeration Basin, where source material was identified between 5.5 feet and 9 feet bgs over approximately 0.2 acre. The WWTP – Northern Source Area is located within the former log run south of Mann Street, where source material was identified between 8 feet and 15.5 feet bgs over approximately 0.6 acre. MGP source material located between the WWTP – Northern Source Area and WWTP – Southern Source Area was previously excavated by the City of Marinette, during WWTP expansion activities. Presumptive major elements of source material excavation include the following:

- Completing predesign investigation to further define horizontal and vertical extent of excavation and provide waste characterization sampling
- Obtaining access agreements from the City of Marinette
- Installing temporary shoring, as necessary to support deeper excavations
- Installing a temporary dewatering system to lower the water table within the excavation footprint
- Excavating non-affected overburden soil and stockpiling onsite for use as post-excavation backfill
- Excavating MGP-source material and transporting to a Subtitle D Landfill
- Backfilling excavation to surrounding grades with granular backfill and stockpiled overburden material
- Restoring the site to previous conditions

In order to reach the vertical extent of source material at the WWTP Zone, excavation below the water table is required. Temporary shoring and dewatering will likely be necessary to support the proposed excavation activities. Conceptually, water will be extracted from the excavation using trash pumps. Extracted water will undergo pretreatment (particle separation and adsorptive media) prior to discharge to the City of Marinette WWTP. Alternative disposal approaches, including surface water discharge through a WPDES permit and offsite disposal, will also be considered. The exact method of water management will be determined during the remedial design stage of the project.

The developed nature or the WWTP parcel combined with geological factors will severely complicate excavation in the WWTP Source Areas. The Southern Source Area is located between an existing building and an aeration basin, which will limit the lateral extent of excavations. There is a potential that City of Marinette will impose restrictions regarding the proximity of excavation to WWTP process units and piping. In addition, the granular nature of the affected soil combined with the known presence of MGP-source material approximately 2 feet below the water table will restrict the vertical extent of excavation.

The Northern Source Area is adjacent to the Canadian National Railroad right-of-way, as well as the large-diameter WWTP influent piping. MGP-source material was identified approximately 7 feet below the water table, which will complicate excavation in this granular material. Further, there is a potential that City of Marinette and/or the Canadian National Railroad will impose restrictions regarding the proximity of excavation adjacent to their infrastructure. The final extent of excavation will be refined through the remedial design process.

Groundwater – *In-situ* Treatment

Removal of all accessible source material from the WWTP Zone and Boom Landing Zone will greatly reduce the mass of sorbed contaminants dissolving into groundwater. Following source material removal, diffusion of contaminant mass sorbed within natural organic material within the saturated soil combined with low PRGs may make it challenging for natural attenuation to achieve groundwater PRGs in a reasonable time. In order to expedite groundwater remediation, Alternative 3 will involve one-time placement of an *in-situ* treatment reagent within the excavation. Reagents will be mixed with the backfill material prior to backfilling the excavation or mixed within material at the base of the excavation prior to backfilling. Following this one-time application of reagent, groundwater is expected to attenuate to PRGs through a combination of the resulting *in-situ* treatment and natural attenuation processes.

The two major categories of reagents used for *in-situ* groundwater treatment are biostimulants and chemical oxidants. There are unique advantages and disadvantages to each approach, which are worth further evaluation during remedial design. Biostimulants are more applicable in Alternative 3 than Alternative 2 because Alternative 3 involves removal of all accessible source material from the WWTP Zone. With removal of this additional source material, the probability of success for bioattenuation of the plume is greatly increased. Further, biostimulants generally have greater persistence (up to approximately 2 years) in the subsurface than chemical oxidants. Conversely, chemical oxidants are generally more aggressive at initially degrading the remaining dissolved-phase plume; however, persistence is generally less than 6 months.

For FS-level analysis and cost estimation purposes, chemical oxidation was selected as the presumptive method of *in-situ* treatment of groundwater for Alternative 2. Chemical oxidation was selected because it is generally more effective at addressing any potential MGP-source that may not be fully removed through excavation activities. *In-situ* oxidation is typically performed using peroxide, persulfate, or permanganate. Catalyzed hydrogen peroxide is an extremely effective oxidant for MGP COCs when injected *in-situ*. Catalyzed hydrogen peroxide generally persists as an oxidant for hours to days. Due to its relatively short persistence, catalyzed hydrogen peroxide is not conducive to the soil-mixing placement procedures proposed as part of Alternative 3, as much of the oxidation would occur during mixing with the soil rather than being released within the groundwater to target the dissolved-phased plume. Permanganate is generally regarded as the most persistent *in-situ* oxidant with persistence of oxidative potential ranging from months to sometimes over 1 year. However, permanganate is not highly effective on MGP residuals, particularly benzene.

An activated sodium persulfate oxidant was selected as the presumptive oxidant for FS-level analysis and cost estimation purposes. This selection was made based on the proven ability of activated sodium persulfate to address the COCs, as well as its ability to persist in the subsurface.

Activated sodium persulfate generally persists for days or weeks and is generally effective on MGP residuals. For purpose of FS-level cost analysis, it is assumed that activation of persulfate will occur using the high pH resulting from calcium peroxide. In addition to activating the persulfate, calcium peroxide also serves as an oxygen-release compound to enhance post-oxidation bioremediation of the plume. Other oxidants or biostimulants may be considered during the design phase.

In-situ treatment using activated sodium persulfate for Alternative 3 will consist of introducing oxidant to the saturated zone of the excavated source areas. The exact method for inducing the oxidant into the saturated zone will be determined during the remedial design. At the recommendation of the vendor, it is assumed that the oxidant will be evenly mixed with the granular backfill prior to placement in portion of the excavation below the water table.

Presumptive elements of *in-situ* treatment include the following:

- Performing bench-scale testing of site soils and groundwater with varying types and percentages of reagents to determine the most effective approach to address COCs in groundwater
- One-time placement of oxidant into the exposed saturated zone resulting from excavation of Boom Landing Zone and WWTP Source Areas. It is estimated that approximately 12 pounds of a sodium persulfate/calcium peroxide mixture per square yard of excavation bottom will be required, resulting in an estimated 16,500 pounds of oxidant /activator in the WWTP Zone and 25,000 pounds of oxidant /activator in the Boom Landing Zone.
- Long-term monitoring until groundwater PRGs are achieved.

It is anticipated that monitoring activities will continue for approximately 30 years to reduce COCs to the selected PRGs.

8. EVALUATION OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives. The purpose of this evaluation is to promote consistent identification of the relative advantages and disadvantages of each alternative, thereby guiding selection of remedies offering the most effective and efficient means of achieving site cleanup goals. While all nine criteria are important, they are weighed differently in the decision-making process depending on whether they evaluate protection of human health and the environment or compliance with federal and state ARARs (threshold criteria), consider technical or economic merits (primary balancing criteria), or involve the evaluation of non-EPA reviewers that may influence an EPA decision (modifying criteria). These nine criteria are described below, followed by a discussion of how each alternative meets or does not meet each criterion.

Explanation of the Nine Evaluation Criteria

Threshold Criteria

1. ***Overall Protection of Human Health and the Environment*** addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed by the site are eliminated, reduced or controlled through treatment, engineering, or institutional controls.

2. ***Compliance with Applicable or Relevant and Appropriate Requirements*** addresses whether a remedy will meet the applicable or relevant and appropriate federal and state requirements, known as ARARs.

Primary Balancing Criteria

3. ***Long-Term Effectiveness and Permanence*** refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met.

4. ***Reduction of Toxicity, Mobility, or Volume Through Treatment*** addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element. This preference is satisfied when treatment is used to reduce the principal threats at the site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.

5. ***Short-Term Effectiveness*** addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction of the remedy until cleanup levels are achieved. This criterion also considers the effectiveness of mitigative measures and time until protection is achieved through attainment of the RAOs.

6. ***Implementability*** addresses the technical and administrative feasibility of a remedy from design through construction, including the availability of services and materials needed to implement a particular option and coordination with other governmental entities.

7. ***Cost*** includes estimated capital costs, annual operation and maintenance (O&M) costs, and the net present value of the capital and O&M costs, including long-term monitoring.

Modifying Criteria

8. ***State Agency Acceptance*** considers whether the state support agency supports the preferred alternative presented in the Proposed Plan and concurs with the selected remedy.

9. ***Community Acceptance*** addresses the public's general response to the remedial alternatives and the preferred alternative presented in the Proposed Plan.

Comparison of Alternatives

Each of the nine evaluation criteria are discussed below with respect to the alternatives under consideration for this remedial action. In addition, Table 5 provides a qualitative summary of how the cleanup alternatives compare against the first seven criteria; the remaining two criteria will be evaluated following the public comment period for the Proposed Plan. More details regarding the evaluation and comparison of the cleanup alternatives against the nine criteria can be found in the site FS Report.

Overall Protection of Human Health and the Environment
Alternative1 is not protective of human health and the environment. This alternative would not improve, reduce, or control risk to human health or ecological receptors due to the presence of source material and MGP-affected media.

Alternatives 2 and 3 would be fully protective of human health with respect to potential risks from soil, groundwater, soil gas and sediment. Both alternatives will remove accessible MGP source material from Boom Landing, and Alternative 3 will remove source material from the WWTP area. Direct contact, ingestion and inhalation of soil with COCs above the PRGs will be prevented through maintenance of existing pavement and building slabs, installation of soil barriers, and implementation of soil institutional controls with an associated Soil Management Plan. Both alternatives will also address the groundwater plume through *in-situ* treatment and controls to prevent use of site groundwater within a defined zone. Potential future soil gas and resulting vapor intrusion risks will be controlled through requirements to complete additional assessment should land use change. Finally, both Alternatives 2 and 3 will implement controls to restrict the removal of the RCM, regular sheen monitoring, and the combination of restrictions and monitoring of sediments.

Compliance with ARARs
Alternative 1 would not meet ARARs.

Alternatives 2 and 3 would meet all potential ARARs that would apply to the various cleanup technologies.

Long-term Effectiveness and Permanence
Alternative 1 would not provide for tracking or confirmation of future achievement of RAOs, so long-term effectiveness would not be demonstrated or documented.

Alternatives 2 and 3 will provide long-term effectiveness and permanent control of potential human health risks from exposure to source material and soil with COCs above PRGs by removing accessible source material, installing horizontal direct-contact barriers in the Boom Landing Zone, and Alternative 3 will also install barriers at the WWTP Zone, restrict land use and intrusive activities, injection of onsite treatment reagents in combination with monitoring will help restore groundwater to PRGs.

Reduction of Toxicity, Mobility, or Volume through Treatment
Alternative 1 does not reduce the toxicity, mobility of volume of the COCs.

Alternatives 2 and 3 will involve excavation and off-site disposal of source area of Boom Landing, and Alternative 3 will involve excavation and off-site disposal of source material from the WWTP Zone, that reduces the volume of the most toxic material at the site. Although off-site disposal does not constitute treatment under this criterion, relocation of affected soil from the site to a permitted disposal facility will control risk from toxicity and reduce contaminant mobility. In addition, source material at Boom Landing is collocated with the well with the highest historical concentrations of benzene and naphthalene. Removal of source material will remove the primary on-going source contributing to the dissolved-phase groundwater plume, and thereby, reducing contaminant mobility.

After surface soil removal, direct contact barriers will be installed, which will reduce the volume of affected surficial soil that is on-site, and reduce the mobility of affected soil by minimizing the potential windward erosion of affected soil. Risk from toxicity will be mitigated through the installation of the horizontal barrier and requiring continuing obligations to ensure long-term risk mitigation. Active measures involving limited *in-situ* groundwater treatment and monitoring will be undertaken to restore the groundwater plume to PRGs.

Short-term Effectiveness

Alternative 1 has no adverse short-term impacts, as no active construction work is associated with this alternative. However, the time to achieve RAOs is also considered as part of the short-term effectiveness criterion, and Alternative 1 would not achieve all of the RAOs. For this reason, Alternative 1 is not considered effective in the short term.

Alternatives 2 and 3 would have the same relative degree of short-term effectiveness. Soil excavations will create the potential for direct-contact exposure during excavation, fugitive volatile organic emissions, and nuisance odors. Transporting affected soil to a landfill creates a short-term impact on the community due to increased truck traffic, noise, and the potential for increased accidents. The risks can be minimized through best-management practices.

Closure of Boom Landing and associated boat launch will be required throughout the duration of excavation activities. The impact of closure of the public space can be minimized by performing remedial excavation outside of regular boating season (between Labor Day until Memorial Day), expected to take three-six months.

For Alternative 3, excavation of source material and surficial soil at the WWTP Zone will have temporary impacts on standard operations and maintenance of the WWTP. Excavation can be conducted in phases to minimize surface area of open excavations and associated short-term impacts to the City.

The groundwater cleanup for Alternative 3 has the potential to generate fugitive emissions and release vapors to the atmosphere during oxidant mixing. As a result, construction workers and nearby building occupants would have the potential exposure to airborne contaminants. These exposures can be controlled through best management practices to limit exposure.

Implementability

Alternative 1 could be easily implemented. No active measures are associated with Alternative 1.

Alternatives 2 and 3 are both readily implementable.

Cost
The estimated total costs for each alternative are FS-level cost estimates that have an expected accuracy of +50% to -30%. Costs for the alternatives range from zero to $7,630,000 as listed below.

Alternative 1 $50,000
Alternative 2 $6,870,000
Alternative 3 $7,630,000

The no-action alternative, Alternative 1, has no cost associated with it. The other two alternatives, Alternatives 2 and 3 have the costs of five-year reviews, estimated at $15,000 per review for 30 years and $42,000 present worth cost, factored into their annual and present worth costs.

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Capital Costs	$0	$6.04M	$6.18M
Annual O&M Costs/LT Costs	$50K	$829K	$1.45M
Total Present Worth Costs	$50K	$6.87M	$7.63M
Construction/Implementation Timeframe	None	3 months	4 months
Time to Completion	N/A	35-115 years	35-110 years

*LT= Long-term (30-year analysis period) *M=Million dollars *K=Thousand dollars

The final cost estimate for the selected remedy will be developed and refined during the RD.

State Agency Acceptance
The State of Wisconsin's acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD for the site.

Community Acceptance
The local community's acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD for the site.

9. EPA's PREFERRED ALTERNATIVE

This section describes EPA's preferred alternative and explains the rationale for those preferences.

EPA's Preferred Alternative – Alternative 3:
Excavation and Offsite Disposal of Accessible Boom Landing Source Material, and Accessible WWTP Material, installation/maintenance of horizontal engineered barriers of affected surficial soil, *in-situ* treatment of affected groundwater, effectiveness monitoring of the sediment reactive core mat and institutional controls to manage potential risks associated with soil, groundwater, soil gas, and sediment

Based on the evaluation of the various remedial alternatives summarized in the *Evaluation of Alternatives* section above, EPA believes that Alternative 3 is the most appropriate cleanup alternative for the WPSC Marinette MGP site.

<u>Alternative 3 includes the following main components:</u>

- Excavation and disposal of accessible source material located within Boom Land Zone and WWTP Zone.
- Installation of horizontal engineered barriers over surficial soil that exceeds PRGs.
- In-situ treatment of affected groundwater and effectiveness monitoring.
- Effectiveness monitoring of the existing reactive core mat.
- Implementation of institutional controls to manage any remaining potential soil, groundwater, soil gas, and sediment risks.
-

Summary of Rationale for the Preferred Alternative
EPA believes that Alternative 3 provides the best balance of the evaluation criteria among all the alternatives. Alternative 3 would be protective of human health and the environment, would meet all federal and state ARARs, would achieve the RAOs for this proposed remedial action, would be straightforward in its implementation, and would be effective in the long term
and permanent.
Alternative 3 would provide long term and permanent protection against exposure to contaminated materials through excavation and disposal of source materials at Boom Landing and WWTP Zones and installation of horizontal engineered barriers. The groundwater plume will be addressed through application of in-situ reagents in the excavated soil areas and monitoring will continue until groundwater PRGs are achieved.

9,500 cubic yards of accessible source material from Boom Landing and the WWTP Zones would be excavated and disposed reducing volume of MGP-affected media. 18,000 cubic yards of soil will be removed to install the horizontal contact barrier. The barrier will reduce toxicity and mobility of affected soil.

Alternative 3 is readily implementable and within the same cost range as Alternative 2, the other alternative with treatment that meets ARARs and RAOs.

Summary
Based on the information currently available, EPA believes the preferred alternative identified above meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. EPA expects the preferred alternative to satisfy the following statutory requirements of CERCLA Section 121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element.

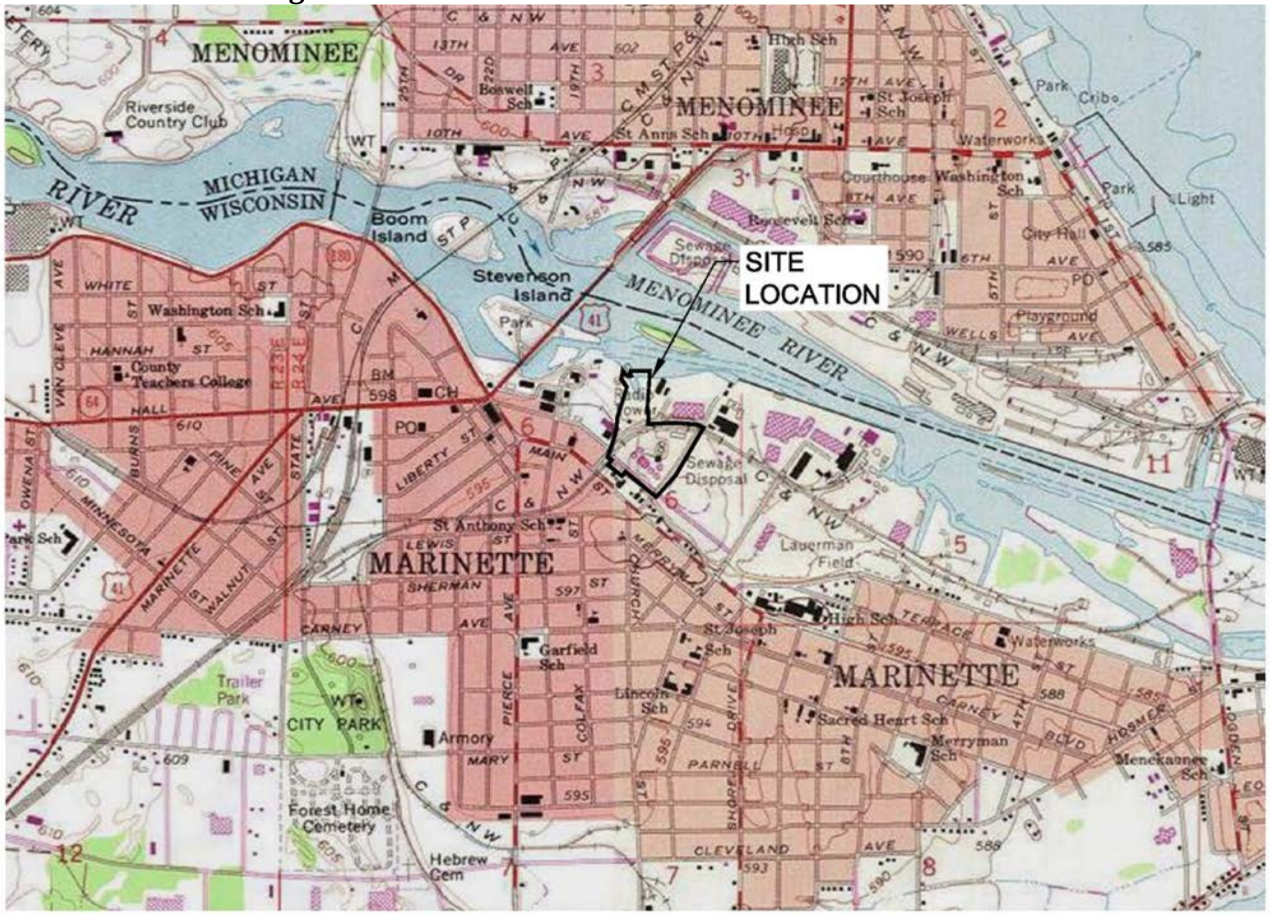
Since it will be several decades before groundwater concentrations attain PRGs, and PAHs may remain in soil above levels that allow for unlimited use and unrestricted exposure (i.e. residential use), the WPSC Marinette MGP site will have the remedy reviewed every five years, in a process that results in a report called the Five Year Review. If the remedy is found not to be effective within a reasonable timeframe, or if new issues arise at the Site, EPA will address it during the Five Year Review process.

Next Steps

EPA, in consultation with WDNR, will evaluate public comments to the preferred cleanup alternative during the public comment period before selecting a final remedial alternative as the site remedy. Based on new information or public comments, EPA may modify its preferred alternative or choose another, so EPA encourages the public to review and comment on all of the cleanup alternatives.

EPA will respond in writing to all significant comments in a Responsiveness Summary which will be part of the ROD. EPA will announce the selected cleanup alternative in local newspaper advertisements and will place a copy of the ROD in the local information repositories and on EPA’s website at https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0509952

Figure 1. WPSC Marinette Former MGP Site Location



SOURCE NOTES:

1. NATIONAL GEOGRAPHIC TOPO. 1:24,000-SCALE MAPS FOR THE UNITED STATES. THE TOPO! MAPS ARE SEAMLESS, SCANNED IMAGES OF UNITED STATES GEOLOGICAL SURVEY (USGS) PAPER TOPOGRAPHIC MAPS. FOR MORE INFORMATION ON THIS MAP, VISIT US ONLINE AT HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA_TOPO_MAPS COPYRIGHT:© 2011 NATIONAL GEOGRAPHIC SOCIETY, I-CUBED
2. COORDINATE SYSTEM IS WISCONSIN COUNTY COORDINATE SYSTEM, MARINETTE COUNTY, US FOOT.

QUADRANGLE LOCATION

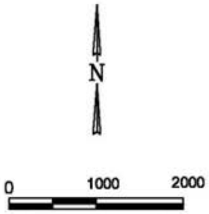


Figure 2. WPSC Marinette Former MGP Site Property Boundaries

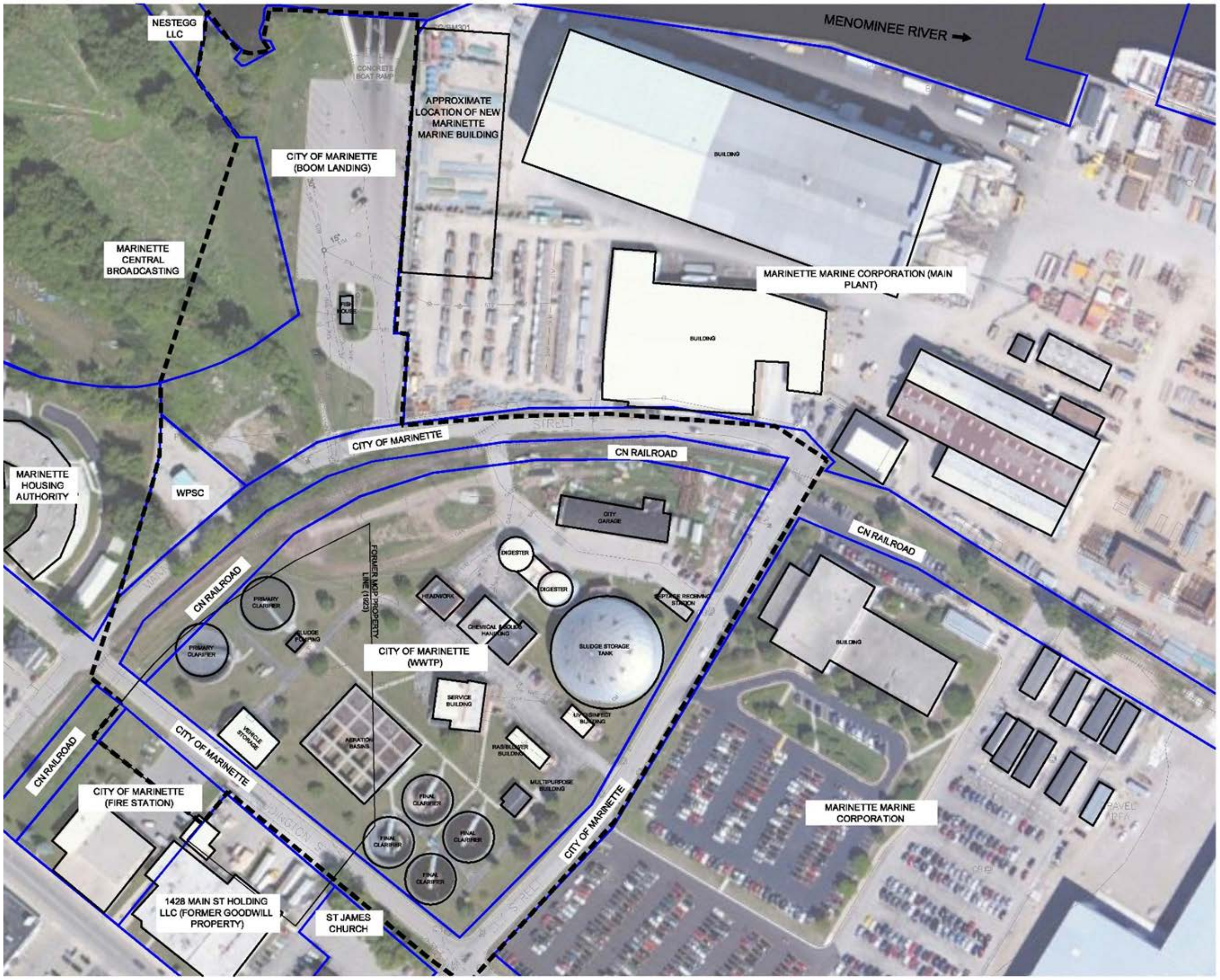


Figure 3. Post-Removal Sediment Conditions

Reactive Core Mat
Dredge Management Unit Boundary
Limits of Residual Sand Layer

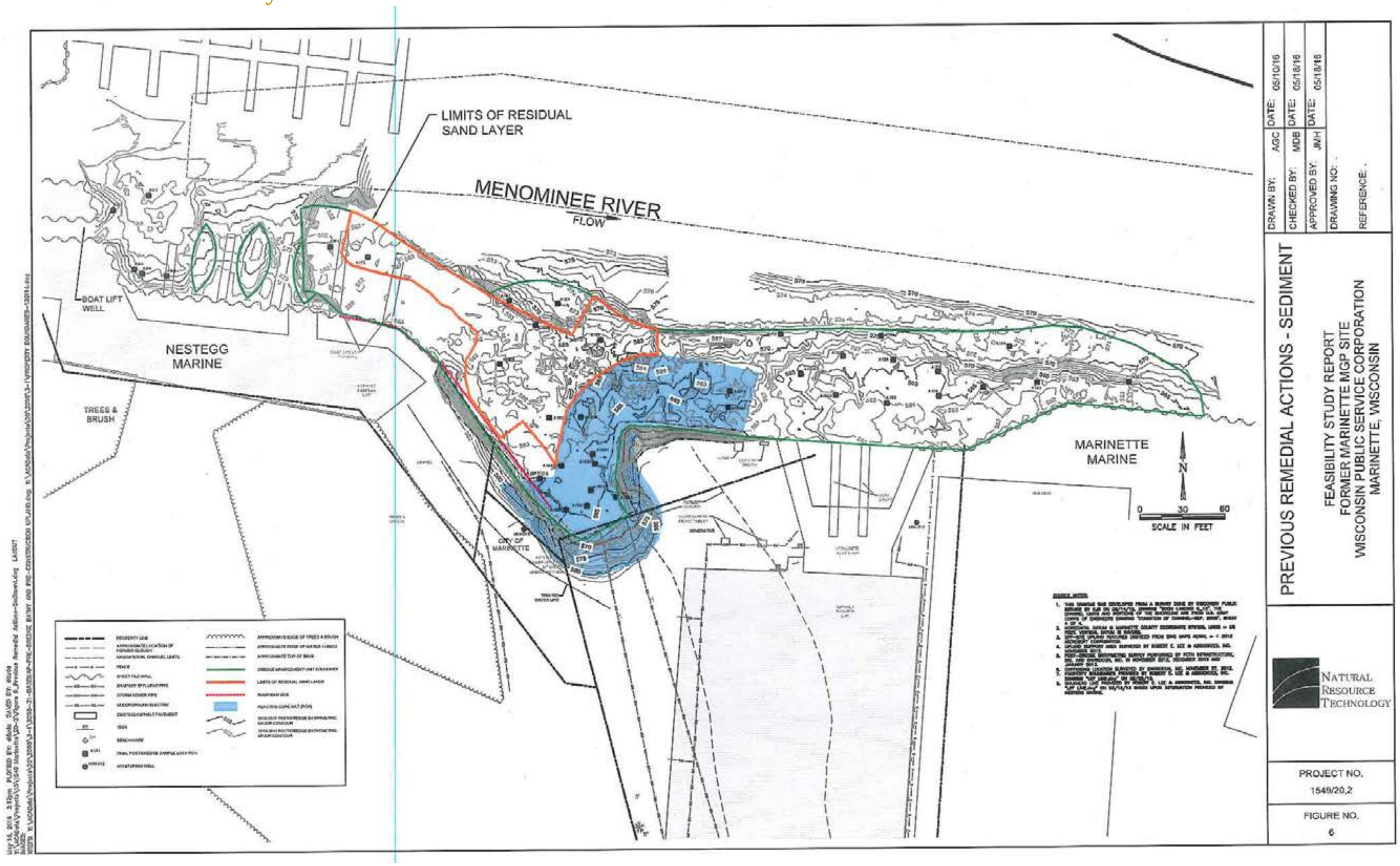


Figure 4. Visual Conceptual Site Model for the WPSC Marinette Former MGP Site

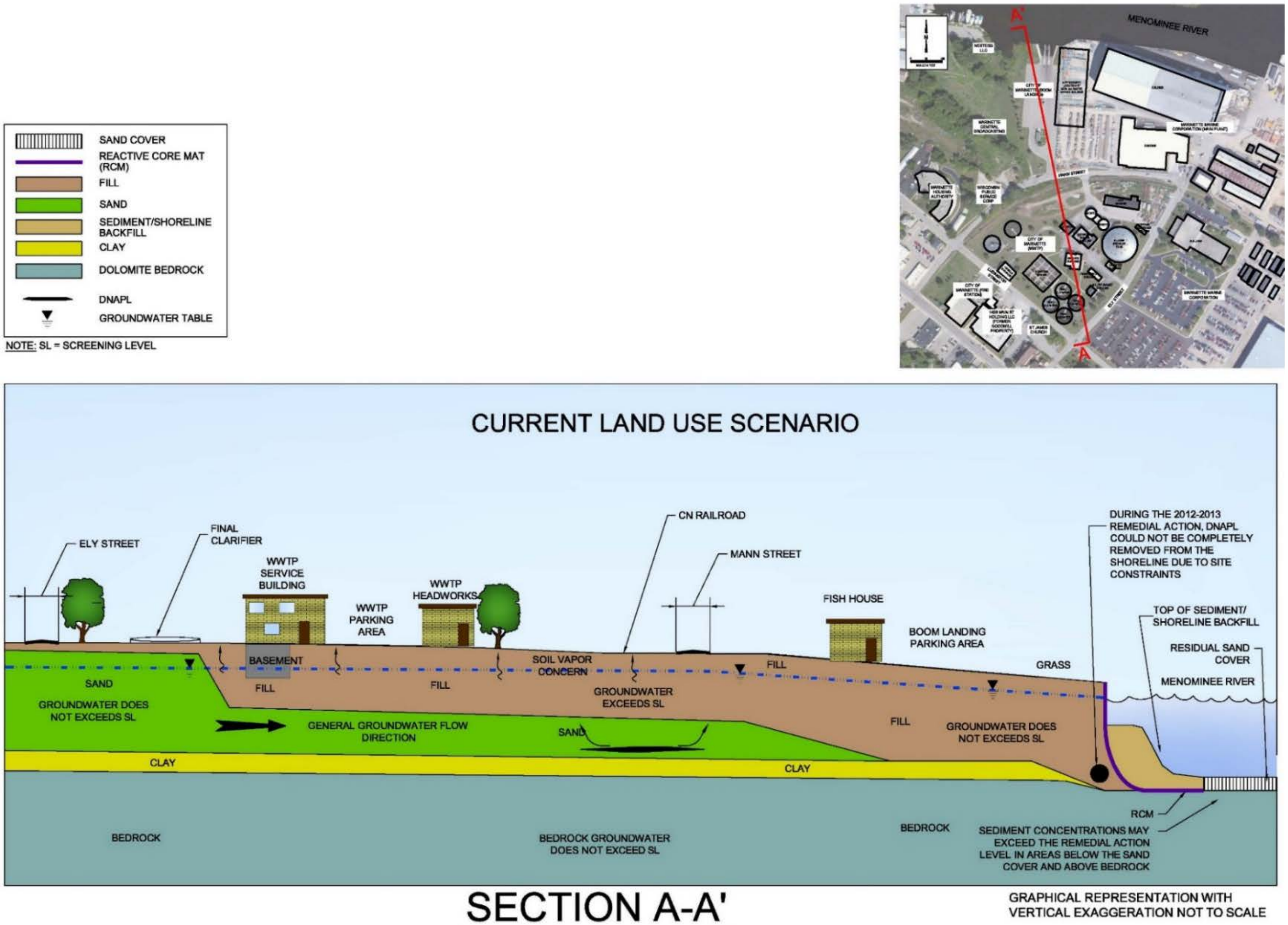
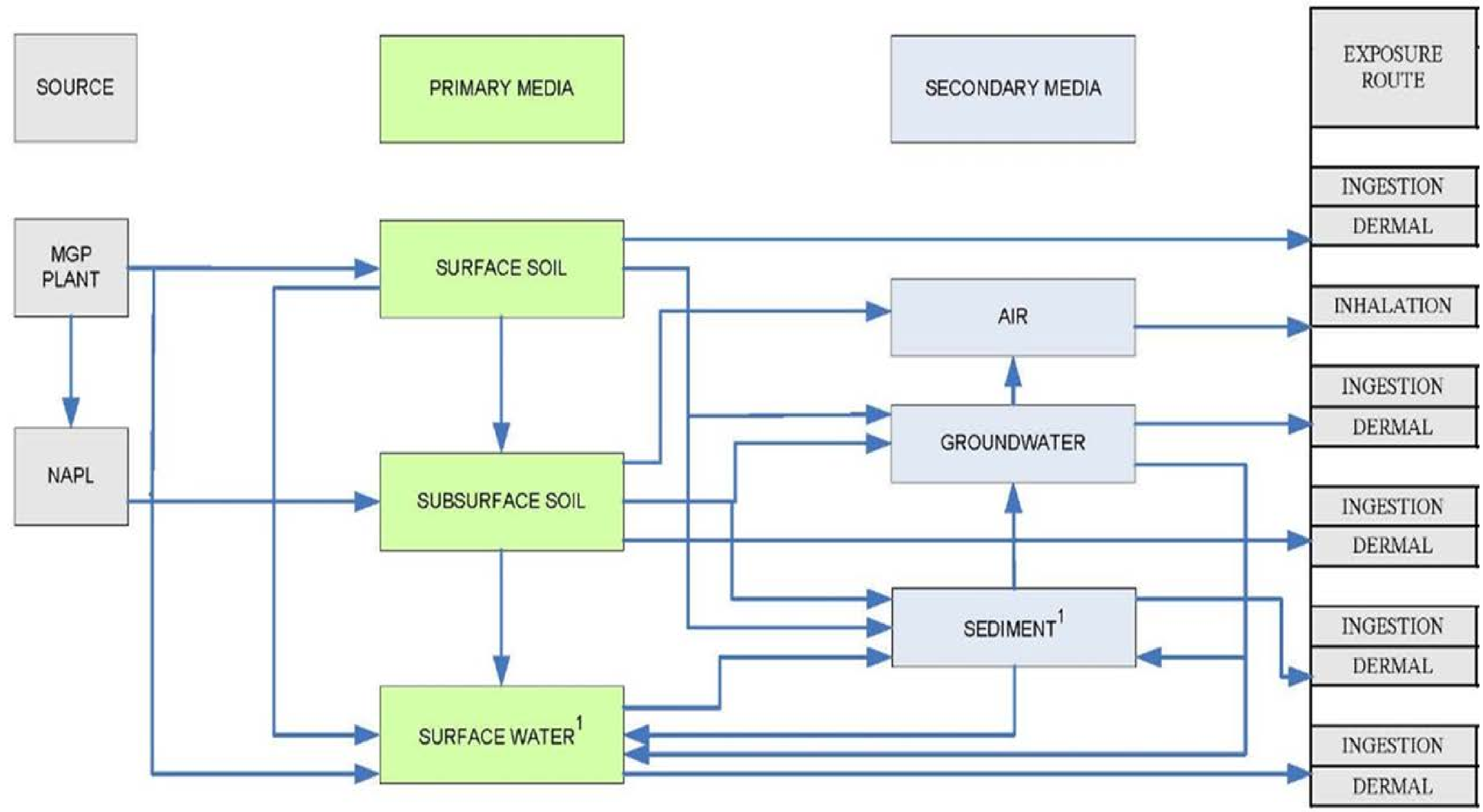


Figure 5. Conceptual Site Model Chart for the WPSC Marinette Former MGP Site



GENERAL NOTES:
This site-specific Conceptual Site Model was developed based on the Generalized Conceptual Site Model Revision 0 (August 5, 2007) and observations made during the July 17, 2009 site reconnaissance, and the results of the sediment remediation and remedial investigation.

[1] A qualitative exposure assessment found this pathway to be incomplete or insignificant under current and future scenarios. Refer to Section 2.3.4 Potential Exposure to Surface Water and Sediment of the BLRA for the details of this assessment.

Figure 6. Estimated Extent of Groundwater Contamination

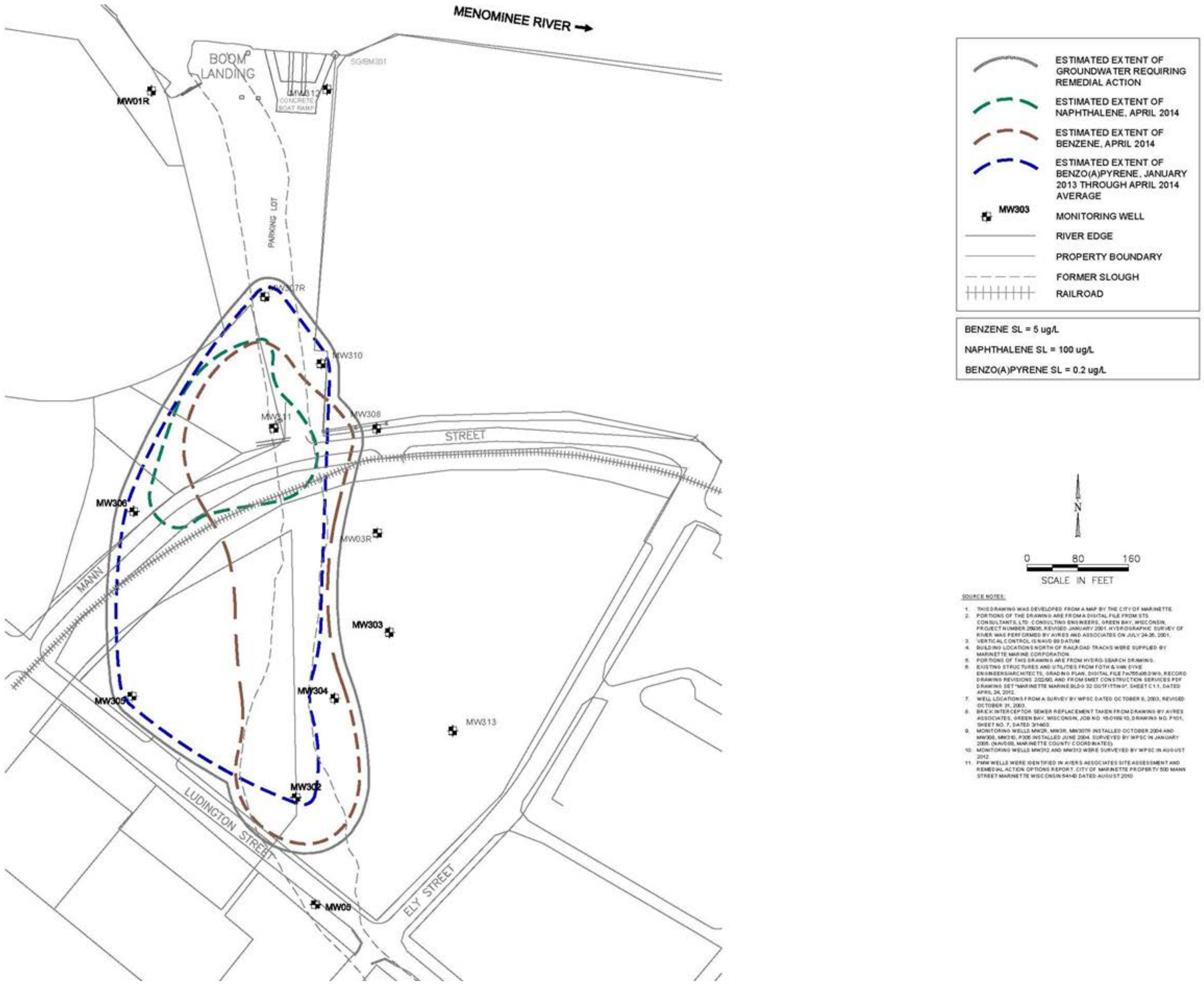


Figure 7. Estimated Extent of Soil Gas Contamination and Possible Vapor Intrusion

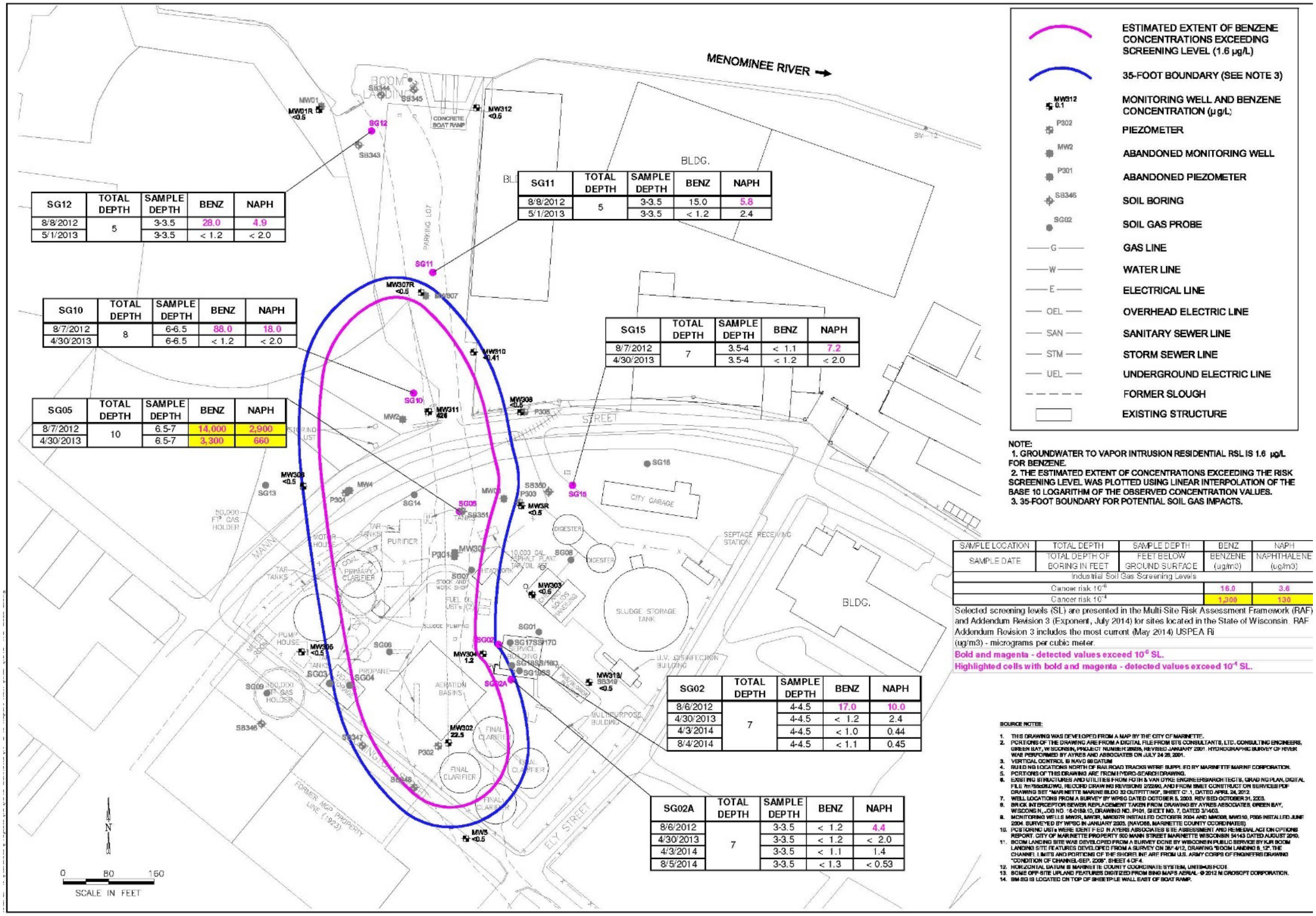
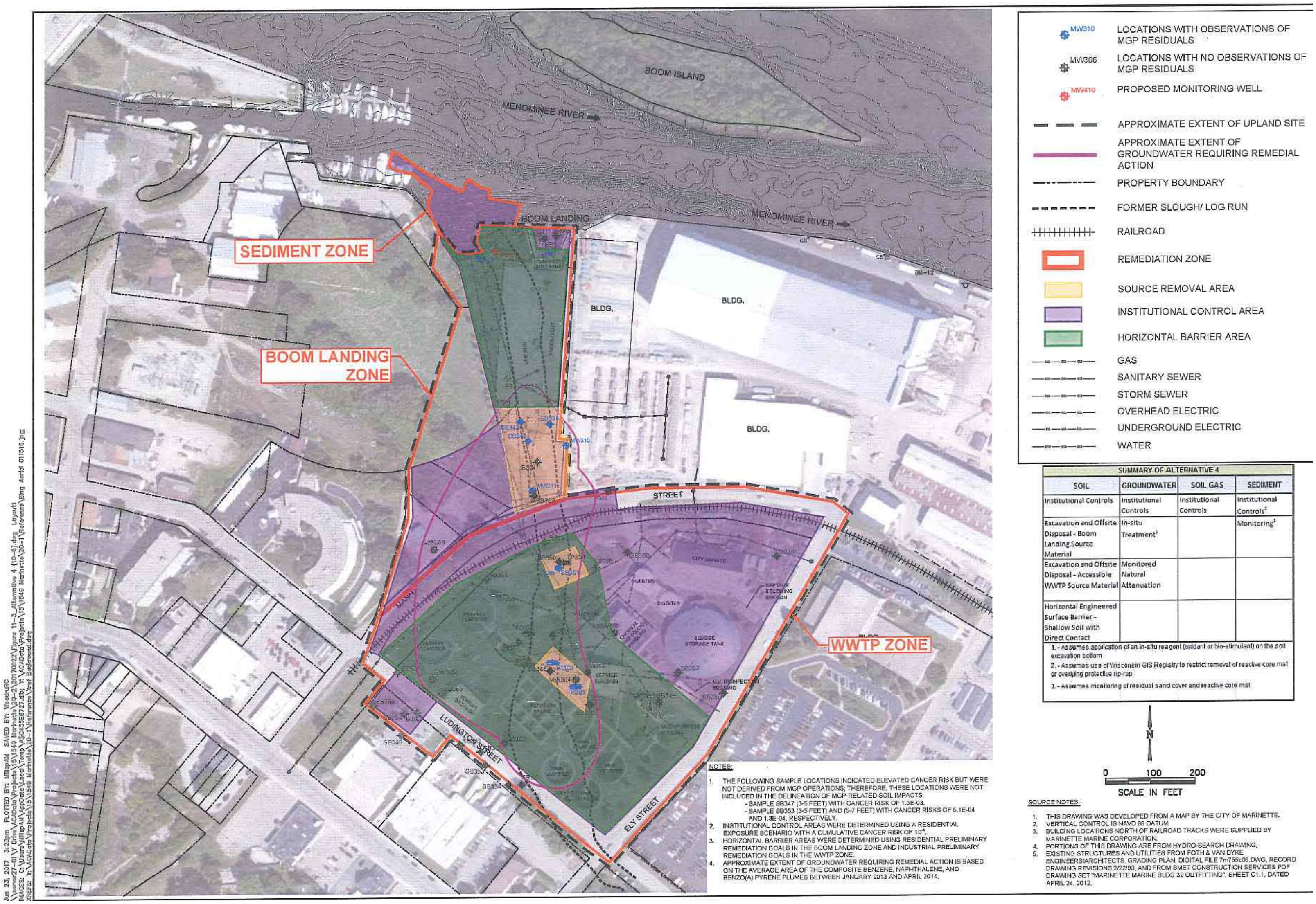


Figure 8. Total Areas to be Remediated Under Alternative 3



SUMMARY OF ALTERNATIVE 4

SOIL	GROUNDWATER	SOIL GAS	SEDIMENT
Institutional Controls	Institutional Controls	Institutional Controls	Institutional Controls[2]
Excavation and Offsite Disposal - Boom Landing Source Material	In-situ Treatment[1]		Monitoring[3]
Excavation and Offsite Disposal - Accessible WWTP Source Material	Monitored Natural Attenuation		
Horizontal Engineered Surface Barrier - Shallow Soil with Direct Contact			

1. - Assumes application of an in-situ reagent (oxidant or bio-stimulant) on the soil excavation bottom
2. - Assumes use of Wisconsin GIS Registry to restrict removal of reactive core mat or overlying protective rip-rap
3. - Assumes monitoring of residual sand cover and reactive core mat

NOTES:

1. THE FOLLOWING SAMPLE LOCATIONS INDICATED ELEVATED CANCER RISK BUT WERE NOT DERIVED FROM MGP OPERATIONS; THEREFORE, THESE LOCATIONS WERE NOT INCLUDED IN THE DELINEATION OF MGP-RELATED SOIL IMPACTS:
   - SAMPLE SB347 (3-5 FEET) WITH CANCER RISK OF 1.3E-03.
   - SAMPLE SB353 (3-5 FEET) AND (5-7 FEET) WITH CANCER RISKS OF 5.1E-04 AND 1.3E-04, RESPECTIVELY.
2. INSTITUTIONAL CONTROL AREAS WERE DETERMINED USING A RESIDENTIAL EXPOSURE SCENARIO WITH A CUMULATIVE CANCER RISK OF 10^{-4}.
3. HORIZONTAL BARRIER AREAS WERE DETERMINED USING RESIDENTIAL PRELIMINARY REMEDIATION GOALS IN THE BOOM LANDING ZONE AND INDUSTRIAL PRELIMINARY REMEDIATION GOALS IN THE WWTP ZONE.
4. APPROXIMATE EXTENT OF GROUNDWATER REQUIRING REMEDIAL ACTION IS BASED ON THE AVERAGE AREA OF THE COMPOSITE BENZENE, NAPHTHALENE, AND BENZO(A) PYRENE PLUMES BETWEEN JANUARY 2013 AND APRIL 2014.

SOURCE NOTES:

1. THIS DRAWING WAS DEVELOPED FROM A MAP BY THE CITY OF MARINETTE.
2. VERTICAL CONTROL IS NAVD 88 DATUM
3. BUILDING LOCATIONS NORTH OF RAILROAD TRACKS WERE SUPPLIED BY MARINETTE MARINE CORPORATION.
4. PORTIONS OF THIS DRAWING ARE FROM HYDRO-SEARCH DRAWING.
5. EXISTING STRUCTURES AND UTILITIES FROM FOTH & VAN DYKE ENGINEERS/ARCHITECTS, GRADING PLAN, DIGITAL FILE 7m755c06.DWG, RECORD DRAWING REVISIONS 2/22/90, AND FROM SMET CONSTRUCTION SERVICES PDF DRAWING SET "MARINETTE MARINE BLDG 32 OUTFITTING", SHEET C1.1, DATED APRIL 24, 2012.

Table 4. Summary of Assembled Alternatives

Alternative Component	Alternative 1	Alternative 2	Alternative 3
SOIL			
No-Further Action	X		
Institutional Controls		X	X
Excavation and Off-site disposal—Accessible Boom Landing Source Material		X	X
Horizontal Engineered Surface Barrier-Shallow Soil—Boom Landing Zone		X	X
Horizontal Engineered Surface Barrier-Shallow Soil—WWTP Zone		X	X
Excavation and Off-site disposal—Accessible WWTP Zone			X
GROUNDWATER			
No-Further Action	X		
Institutional Controls		X	X
Monitoring		X	X
In-situ Treatment		X	X
SOIL GAS			
No-Further Action	X		
Institutional Controls		X	X
SEDIMENT			
No-Further Action	X		
Institutional Controls		X	X
Monitoring		X	X

Table 5: Alternatives Comparative Analysis

Alternative	Removal Volume (CY) and Barrier Surface Area (SF)	Years to Reach PRGs	Overall Protection of Human Health and Environment	Compliance with ARARs	Short-term Effectiveness	Long-term Effectiveness	Reduction of Toxicity, Mobility, and Volume Through	Implementability	Total Cost
1	0	Undocumented	Undocumented	Undocumented	Not Effective	Undocumented	No Treatment	Nothing to Implement	$50K
2	85,700/ 242,000	35-115	Protective	Complies	Effective	Effective	Volume Reduction	Readily Implementable	$6.87M
3	290,100/ 242,000	35-110	Protective	Complies	Effective	Effective	Volume Reduction	Readily Implementable	$7.63M