Prepared for:
Superior Water Light & Power Company
Superior, Wisconsin




Remedial Action Options Report
Superior Water Light & Power MGP
Superior, Wisconsin
WDNR BRRTS #02-16-275446

ENSR Corporation
February 5, 2008
Document No.: 09413-098

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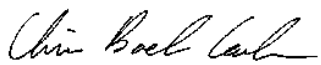

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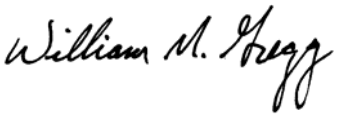

Reviewed By: William M. Gregg

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1.0 Introduction

ENSR Corporation (ENSR) has prepared the following Remedial Action Options Report for the Superior Water Light & Power (SWL&P) Former Manufactured Gas Plant (MGP), located at the intersection of Winter Street and East 1st Street in Superior, Wisconsin (site). The site location is shown in **Figure 1**. This report has been prepared in accordance with the Wisconsin Administrative Code Chapter NR 722.

1.1 Background

1.1.1 Site History

The gas plant was built in 1888 and began operations on November 1, 1889. The gas plant produced carbureted water gas made by the improved "Springer" process. Two gas holders were initially constructed on the site: one single lift holder of 35,000 cubic feet capacity, built in October 1889, and one double lift holder of 250,000 cubic feet capacity, dimensions of 92 ft x 21 ft x 21 ft, completed in October 1891. In 1924, a third gas holder was constructed at the site. This 750,000-cubic foot gas holder was located southwest of the former MGP building. A spherical gas holder called the "Horton Sphere" was constructed in 1950.

Gas was produced at the Superior MGP from November 1889 to August 1904. After August 1904, all gas sold by SWL&P was purchased from the Zenith Furnace Company (later known as Interlake Corporation). The gas purchased from Zenith/Interlake was purified in West Duluth before it was piped to SWL&P's plant in Superior. Therefore, no purifier wastes were generated at the site after August 1904. The MGP at the site produced a total of approximately 262,000 MCF (million cubic feet) of gas during its 15-year production history.

In 1929, the gas plant building was rebuilt to its present configuration. Gas purchased from Zenith/Interlake was stored in the gas holders, and pumped and metered from the reconstructed building. Storage and metering of manufactured gas purchased from Zenith/Interlake continued until natural gas supplies became available in 1959. The 35,000-cubic foot gas holder was removed prior to 1938. The 250,000-cubic foot gas holder was removed between 1940 and 1961. The 750,000-cubic foot gas holder was removed between 1962 and 1966, and the Horton Sphere was removed in 1985.

In 1978, SWL&P sold the former gas plant building and portions of the property to CLM, Inc. The building was gutted, concrete floors were poured over the existing sand floors, and the building has been used for storage since that time.

1.1.2 Previous Investigations

ENSR conducted a Phase I environmental assessment at the site for SWL&P in September/October of 2001. The Phase I report indicated that gas was manufactured at the site for fifteen years, ending in 1904. Areas of the site that had potential to contain MGP-related chemicals and/or byproducts were identified as part of the Phase I assessment. ENSR performed a Phase II site investigation from November 2001 through February 2002. Results of the Phase II indicated areas of the site contained volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAH) compounds in the soil above Wisconsin Department of Natural Resources (WDNR) Residual Contaminant Levels (RCL). Groundwater samples contained benzene, toluene, ethylbenzene, and xylene (BTEX) and PAH compounds above the WDNR groundwater Enforcement Standard (ES). South of the site building, an area contained exclusively BTEX of unknown origin. Other site areas contained both PAH and BTEX. The former gas holder tank bases were investigated with a backhoe. MGP wastes were not found in association with the tank bases. Soil containing tarry residues and PAH were found in the area between the former site building and the 1904-era shoreline.

A Phase II, Part II Investigation was completed in September 2002 to further delineate the PAH and BTEX in the soil and groundwater. Fingerprinting analytical results indicated the VOCs found south of the site building (near the former Horton Sphere gas holder) appeared to be a blended solvent or degreaser consisting of primarily benzene and toluene with lesser amounts of ethylbenzene and xylene. In addition, a test trench excavation north of the site building encountered a clay tile pipe oriented toward the former Superior Bay shoreline that contained tarry material. The tarry material was analyzed using "fingerprinting" techniques and appeared to be carbureted water gas coal tar. Soil at the end of the clay pipe contained some tar masses as well as residual tar in surrounding soils. The results of the Phase II, Part II investigation indicated additional BTEX and PAH impacts downgradient of the site.

A sediment investigation was completed in the Superior Bay boat slip and nearby storm sewers in March and April 2003. The sediment results indicated concentrations of PAH similar to typical urban run-off in the storm sewer and boat slip. Thus, the investigation shifted back to soil and groundwater in upland areas of the site.

The Phase II Part III subsurface investigation was completed in October and November 2004. The investigation consisted of installing eight soil borings, B-24 through B-31, and five monitoring wells, MW-8 through MW-12, located off-site to the north and east of the site. The results indicated that the plume of dissolved BTEX and PAH in the groundwater followed the groundwater flow direction and are found off-site northeast and east of the site.

Soil containing tarry residues was observed while drilling well MW-8. The MW-8 boring did not encounter tarry masses or mobile tar. None of the wells at the site have collected mobile tar (no measurable free product). The tarry residues appeared to extend from the terminus of the clay pipe on-site to the southeast towards MW-8, in the area along the former shoreline. Tarry residues were not found in the area between the railroad tracks and Superior Bay. However, additional investigation was needed to determine the extent of the tarry residues.

The Phase II Part IV subsurface investigation was completed in 2005 and 2006 to delineate the extent of tarry residues in the subsurface, and the extent of downgradient VOC and PAH groundwater impacts. The May 2007 Phase II Part IV report summarizes the results of the investigation and a site specific human health risk assessment. **Figure 2** shows the sample locations for the investigations conducted at the site. The following site work was completed as part of the Phase II Part IV investigation:

- Completed membrane interface probe (MIP) borings for VOC delineation in September 2005.
- Completed groundwater VOC plume delineation using mobile on-site laboratory in September 2005.
- Completed first round of Tar-specific Green Optical Screening Tool (TarGOST^{TM}) borings for coal tar delineation in October 2005.
- Installed monitoring wells MW-13 through MW-22 in October 2005.
- Collected groundwater samples from all site monitoring wells in November 2005.
- Completed second round of TarGOST borings in May 2006.
- Completed two TarGOST confirmation Geoprobe soil borings in May 2006.
- Completed surface soil sampling in May 2006.
- Collected groundwater samples from MW-13 through MW-22 in October 2006.
- Completed slug tests on wells MW-15 through MW-22 in October 2006.

The Phase II Part IV Investigation completed the delineation of VOC and PAH in the soil and groundwater. The results of the human health risk assessment indicated potential excess risk on the former MGP property for the soil to ambient air, soil to indoor air, and direct contact exposure scenarios.

1.2 Objectives

The purpose of this report is to identify and evaluate likely remedial action options for "source" soil (soil that contains tarry residues and has potential excess risk) and selects the most appropriate (cost effective and technically feasible) option. Once source soils have been addressed, monitored natural attenuation is expected to address dissolved contaminants in groundwater. This report includes:

- A summary of the nature and extent of impacted soil and groundwater;
- A summary of the geological and hydrogeological conditions across the study area;
- A review of applicable remedial action options for the Site; and
- An overview of the selected remedial action.

1.3 Site Location, Ownership and Consultant/Contractor Information

The former Superior MGP Site is located in the vicinity of the intersection of Winter Street and East 1st Street in Superior, Douglas County, Wisconsin. The Site occupies a portion of the northeast quarter of the northwest quarter of Section 13, Township 49 North and Range 14 West (SW ¼, NW ¼ of Sec. 13, T49N, R14W). The Site location is depicted on Figure 1.

Portions of the former MGP property are now owned by Superior Water Light & Power (SWL&P), the City of Superior, the U.S. Department of Transportation, and CLM, Inc. **Figure 3** is a color-coded map indicating property ownership in the vicinity of the MGP Site.

The owner contact is:

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ENSR has been retained as the consultant at the Site. The consultant information is as follows:

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1.4 Nature and Extent of Soil Impacts

1.4.1 Surface Soil

Surface soil (soils within four feet of ground surface) samples were collected as part of the Phase II Part IV Investigation from areas of the site where the MGP formerly operated. Surface soil samples were also collected from soil borings, well borings, and test trenches during previous investigations. VOC surface soil analytical results were compared to the Protection of Human Health from Direct Contact with Contaminated Soil, Table 2, NR 746 criteria. PAH soil analytical results were compared to Soil Cleanup Levels of Polycyclic Aromatic Hydrocarbons Interim Guidance, WDNR Publication RR-519-97, Industrial Direct Contact Pathway.

Based on a review of the analytical results (**Table 1**), surface soil is impacted above the criteria in the following locations:

- Samples T8-S1, B-15-1-3, SS-5, SS-10, and SS-14 contained concentrations of benzene above the NR 746 direct contact criteria. The benzene detections are likely due to separate sources in each of the sample locations, as opposed to a large contiguous source. Prior investigations have found MGP residues and/or a benzene-rich solvent at these sample locations.
- PAH were found in several of the surface soil samples at concentrations above the WDNR PAH Interim guidance direct contact criteria including B-15-1-3, MW-20, SS-2, SS-5, SS-6, SS-7, SS-8, SS-10, SS-13, SS-19, T1-S1, and T9-S2. Most of these samples were located in the gravel yard around the former MGP building.

1.4.2 Subsurface Soil

Laboratory analytical results indicated that subsurface soils (soils at depths greater than four feet below ground surface) are also impacted by VOC and PAH. The subsurface soil VOC results were compared to the Residual Contaminant Level for Protection of Groundwater, Table 1, Soil Cleanup Standards, NR 720. PAH subsurface soil analytical results were compared to Soil Cleanup Levels of Polycyclic Aromatic Hydrocarbons Interim Guidance, WDNR Publication RR-519-97, Protection of Groundwater Pathway. Subsurface soil sample analytical results are summarized in **Table 2**. The BTEX and several PAH concentrations in on-site and off-site soil samples exceeded the protection of groundwater criteria.

1.4.3 Risk Assessment Results

Based on the results of the Human Health Risk Assessment included in the Phase II Part IV report, concentrations of VOC in subsurface and surface soils potentially pose excess risk for the volatilization to ambient air and indoor air inhalation pathway. The following is a summary of the areas on the former MGP property with excess risk:

- Benzene in surface and subsurface soil (soil to ambient air modeling). The samples and areas at the former MGP with the highest concentrations of benzene in soil are located near or north of the former MGP building (B-11, B-12, B-13, B-14, B-15, B-16, B-17, MW-7, T-9) or south of East 1st Street near the former Horton Sphere (B-8, B-10, MW-4, T-8). The concentration at MW-7 (maximum detect) was used as the benzene exposure point concentration for ambient air modeling.
- 1,3,5-trimethylbenzene in surface and subsurface soil (soil to ambient air modeling). The location with the highest 1,3,5-trimethylbenzene concentration is B-15, north of the former MGP building.
- Benzene in surface and subsurface soil (soil to indoor air modeling). The concentration at T9-S2 (maximum detect near building) was used as the benzene exposure point concentration for ambient air modeling.
- Benzo(a)pyrene in surface soil (direct contact). The concentration at sample location B-13, (23 mg/kg) dominates the risk calculation.

The use of maximum concentrations likely overestimates the potential risks. The risk assessment identified areas and chemicals of potential concern that may warrant further investigation, advanced risk assessment, and/or remediation. These include benzene and 1,3,5-trimethylbenzene in soil near and north of the former MGP building and benzo(a)pyrene in surface soil at the site.

1.4.4 Tarry Residues

A test trench excavation north of the MGP building encountered a clay tile pipe oriented northeast toward the former shoreline that contained tarry masses and residues. The tarry masses were analyzed using fingerprinting techniques and appeared to be carbureted water gas coal tar. Soil borings and test trenches revealed tarry residues oriented along the former shoreline. The TarGOST borings also confirmed that the highest concentrations and thickest deposits occur near the terminus of the clay pipe. This area is interpreted to be the "source area" for dissolved PAH in groundwater and tarry residues found in downgradient areas. The physical appearance and distribution of tarry residues are consistent with the discharge of wastewater from the clay pipe and subsequent transport and deposition along the former shoreline. Using the TarGOST, the tarry residues were delineated as illustrated on **Figure 4**.

No free product has been measured in the monitoring wells at the site. The MGP residue detected by the TarGOST does not appear to be mobile, but is a source of dissolved PAH and VOC in the groundwater. The tarry residue appears to be adsorbed to the soil matrix where it was historically deposited based on the following observations:

- The tarry residue was found within the fill material and has not migrated downward to the clay basal unit or to other lower permeable materials in most locations.
- Measurable free product has not accumulated in monitoring wells completed within the tarry residues (such as wells MW-7 or MW-8).
- The tarry residues do not follow groundwater flow direction and appear to be located where they were historically deposited. The tarry residues do not appear to be migrating.

1.5 Nature and Extent of Groundwater Impacts

The groundwater analytical results were compared to Wisconsin NR 140 Enforcement Standards (ES). Groundwater analytical results from the most recent groundwater monitoring event are summarized in **Table 3**. As shown in Table 3, VOC and PAH concentrations exceed the ES. The extent of dissolved PAH in groundwater was delineated to the ES criteria as illustrated on **Figure 5**. The location of the dissolved PAH plume with concentrations above the ES appears to be similar to the location of tarry materials delineated by the TarGOST borings. The majority of VOC soil and groundwater impacts were found commingled with the tarry residues and PAH plume. The extent of the dissolved VOC plume in groundwater at concentrations above the ES is illustrated on **Figure 6**.

Dissolved VOC and PAH are present downgradient from the former shoreline source area, migrating with groundwater through an aquifer that consists of fill materials. Other isolated areas of PAH and VOC, such as near the former gas holders, do not appear to be migrating due to the clay soils at those locations.

1.6 Chemicals of Potential Concern

Chemicals detected in the soil and groundwater at the site during the previous site investigation activities were screened against applicable standards. Chemicals that were detected at concentrations greater than or equal to the applicable standard were considered chemicals of potential concern (COPCs). Additionally, chemicals that were detected in greater than ten percent of the samples, but for which there were no applicable standards, were also considered COPCs. The site investigation identified the following COPCs:

1,2,4-Trimethylbenzene (soil only)	Benzo(a)pyrene
1,3,5-Trimethylbenzene (soil only)	Benzo(b)fluoranthene
Benzene	Benzo(ghi)perylene
Ethylbenzene	Benzo(k)fluoranthene
Toluene	Chrysene
Xylenes	Dibenz(a,h)anthracene
1-Methylnaphthalene 2-Methylnaphthalene	Fluoranthene Fluorene
Acenaphthene	Indeno(1,2,3-cd)pyrene
Acenaphthylene	Naphthalene
Anthracene	Phenanthrene
Benzo(a)anthracene	Pyrene

1.7 Lithological, Geological and Hydrogeological Site Characteristics

1.7.1 Geology

The MGP site is located at an elevation between 610 and 615 feet above mean sea level. The topography of the former MGP is relatively flat with little or no slope. To the northeast of the former MGP, the topography slopes down towards the railroad tracks. The land surface to the north of the railroad tracks is relatively flat with most elevations between 605 and 607 feet above mean sea level. The water elevation in Superior Bay is approximately 601 feet above mean sea level.

Aerial photographs and historic maps of the City of Superior, obtained during the Phase I, indicate the former Superior Bay shoreline was originally located approximately 50 to 75 feet northeast of the MGP building. Water was present between the former shoreline and the railroad track causeway in Superior Bay (referred to as the "pond" in historic documents). By 1905, the area between the former shoreline and the railroad tracks had been filled, and no water was present. Various shoreline development and filling activities continued between 1905 and 1978. The 1978 aerial photo depicts the area north of the railroad tracks in its current configuration.

The results of the subsurface investigations indicate that there are several predominant soil types encountered in the area:

- Reddish-brown high-plasticity clay;
- Sand and silty sand;
- Fill material consisting primarily of light gray to dark gray lime-like material; and
- Miscellaneous fill such as bricks, wood, slag, and cinders.

According to the Bedrock Geology of Wisconsin map, sandstone bedrock (Keweenawan Formation) may be found beneath the unconsolidated soils. Depth to bedrock is estimated to be from 100 to 200 feet below the ground surface. (Wisconsin Geological and Natural History Survey http://www.uwex.edu/wgnhs/bdrk.htm)

During previous investigations, several borings were installed at the City of Superior wastewater treatment plant (WWTP) located east of the site. The WWTP was constructed on fill placed in Superior Bay and the borings encountered primarily sandy soil. Dredge spoils were likely used to create the land for the WWTP. Wood waste and saw dust are also present in this area owing to the former use of this property as a saw mill.

Borings installed along the south side of the rail road tracks and in the gravel parking area north of the MGP building encountered lime-like fill material as the uppermost soil type. Underlying the lime-like fill material was silty sand along with miscellaneous fill (slag, wood, brick, etc.) in some borings. Underlying the sand unit or miscellaneous fill was reddish-brown high plasticity clay. The elevation of the clay unit appears to slope northeast and east-northeasterly, towards Superior Bay. Clay was encountered at the ground surface in the borings located southwest of the MGP building. **Figure 7** illustrates the elevation of the clay soil.

1.7.2 Hydrogeology

North of the MGP building, groundwater was encountered in the sand, silty sand, or fill material above the red clay. Groundwater was encountered approximately two to five-feet below the ground surface in the wells along the railroad track right-of-way and to the north. Groundwater was approximately eight to eleven-feet below the ground surface in the wells south of the railroad tracks. Depth to groundwater was gauged prior to collecting groundwater samples from the monitoring wells. The gauging data results from October 2006 are summarized in **Table 4**. Groundwater elevation contours from October 2006 are illustrated on **Figure 8**. The apparent groundwater flow direction at the site appears to be northeast towards Superior Bay.

Results of the slug tests performed on the monitoring wells indicate hydraulic conductivity of the aquifer ranged from 10^{-5} centimeters per second (cm/s) to 10^{-3} cm/s in wells installed in the lime-like material and 10^{-3} to 10^{-1} cm/s in wells installed in the sand unit. Slug tests were not completed on wells screened in the clay soil because of the slow recharge rate. For example, static water levels were reached in wells MW-13 and MW-14 several months after installation. Hydraulic conductivity of the clay unit is estimated to be less than 10^{-6}. Hydraulic conductivity values are summarized on Table 4.

Wells MW-1 through MW-7 and MW-13 and MW-14 are completed in clay or lime-like material and have lower hydraulic conductivities. As illustrated in Figure 8, the groundwater hydraulic gradient is steeper in the area of these wells. Wells MW-8 through MW-12 and MW-15 through MW-22 are completed in sandy soil, have higher hydraulic conductivity, and have a flatter hydraulic gradient. For example, south of the former shoreline in the clay soil, the average hydraulic gradient was approximately 0.032; and north of the former shoreline in the sandy soil, the average hydraulic gradient was approximately 0.009.

The thickness of the fill and sand aquifer resembles a “wedge” shape that increases in thickness towards Superior Bay. The thickness of the aquifer is measured from the water table down to the clay layer. The thickness ranges from 5 feet in MW-7 near the former shoreline to 14 feet thick north of the railroad tracks in MW-11. The thickness of the aquifer is expected to increase towards the northeast on the WWTP property; however, the clay layer was not encountered in the borings completed on the WWTP property.

1.8 Potential Receptors

1.8.1 Surface Waters

The site is located near an industrial boat slip on Superior Bay in Lake Superior. Stormwater runoff and groundwater from the site may enter the boat slip. A storm sewer conveys runoff from the city to the boat slip.

1.8.2 Groundwater Supply Wells

ENSR obtained well construction reports from the Wisconsin Geological and Natural History Survey (WGNHS) for the period of 1936 through the present for wells within 1.5 miles of the Site. These records were reviewed for potential receptors within 1,200-feet of the site, per NR 716. Copies of the well construction records obtained from WGNHS are included in **Appendix A**. Based on a review of the well construction records, there are no wells within 1,200-feet of the site. Municipal drinking water supply is obtained from Lake Superior via horizontal wells installed over a mile from the site in the bed of the lake.

1.8.3 Underground Utilities

A storm sewer line runs along the boundary of the former MGP property and Lakehead Cement and discharges into the boat slip in Superior Bay. Sanitary sewer lines are located along the railroad tracks, and crossing Lakehead Cement, to enter the WWTP property. Lakehead Cement has laterals for natural gas and water from main lines under East 1st Street. A water line for a fire hydrant is located near the former Horton Sphere. The remaining utilities are located either above ground or in the nearby road right-of-way. Based on the contaminant distribution found at the site, it does not appear that the utilities are acting as preferential flow pathways. Based on the results of the Sediment Investigation (March 2004), the sediment within the nearby storm sewer and sediment located at the storm sewer discharge point have not been measurably impacted by the site contaminants.

1.8.4 Underground and Aboveground Structures

Other than remnants of building foundations and gas holder bases, there are no known underground structures on the former MGP property or on the adjacent CLM, Lakehead Concrete, or WWTP properties.

The only aboveground structure on the former MGP property is the brick building which is currently used for storage by CLM. There are aboveground structures on the neighboring properties including a single family residence to the southwest, two Lakehead Concrete buildings to the southeast, numerous WWTP buildings to the east, and CLM buildings to the north.

1.9 Waste Characterization of Impacted Soil

Effective March 13, 2002, the United States Environmental Protection Agency (USEPA) vacated the ruling that provides for the use of the toxicity characteristic leaching procedure (TCLP) for determining whether MGP waste exhibits the characteristic of toxicity under the Resource Conservation and Recovery Act (RCRA; 40 CFR Part 261). Based on this ruling there is no current mechanism for MGP wastes to be regulated under RCRA. However, to determine soil disposal options and costs prior to remediation, ENSR will collect soil samples from the source area near the clay pipe for analysis of TCLP Metals, TCLP VOC, VOC, PAH, and Reactive Cyanide.

2.0 Remedial Action Options

2.1 Remedial Objectives

The overall objective for the site is to reduce site risks by removing or treating persistent MGP-related chemicals (tarry residues) in source soils. By removing or lessening the source soil concentrations, contaminants dissolved in the groundwater will be more susceptible to natural attenuation and concentration reduction. Implementing a remedial action should accomplish the following:

- Reduce human health risk from direct contact with contaminated soil;
- Reduce human health risk from contaminants which may volatilize into indoor and ambient air;
- Reduce the persistent groundwater contaminant source; and
- Address dissolved contaminants in groundwater.

An appropriate range of remedial alternatives is presented in the following sections. Each alternative identified has been evaluated in accordance with the evaluation criteria listed in NR 722.07 of the WAC.

2.2 Remedial Alternatives for Source Soil

2.2.1 Alternative #1 – Excavation and Off-Site Disposal of Source Soil

Physical/Operations Description: A portion of the source soils and tarry residues is relatively shallow and accessible. This alternative involves excavating accessible source soil and hauling it off-site for disposal at a WDNR approved solid waste recycling and disposal facility (RDF). Source soil contains tarry residues and is located along and at the terminus of the clay pipe found in trenches TR-9 and TR-10.

As shown in **Figure 9**, the amount of soil to be excavated is estimated at 2,000 cubic yards or approximately 2,800 tons. The actual amount excavated will depend on conditions encountered in the field (e.g., water table conditions, the amount of clean soil overlying the source soils, etc.). Clean fill material will be imported to the site to replace the excavated soils. The excavation will be done in cold weather to minimize odors and VOC emissions. A combination of fugitive air emission controls, air monitoring, or other measures are likely to be necessary to perform this alternative to protect public health. Other activities associated with this alternative are design and specifications development, subcontractor bidding and coordination, permitting, backfill compaction, soil sampling, final site restoration, reporting, and closure documentation.

Technical Feasibility: This alternative is considered technically feasible and would be effective in achieving the remedial objectives and goal of risk reduction. This alternative will immediately reduce the levels of soil contamination at the site and will reduce a source of contaminants to the groundwater. Excavation would not be feasible to address source soil impacts in areas that are not accessible, such as the tarry residues present along the railroad tracks.

Economic Feasibility: Excavation and off-site disposal of impacted soil is often considered a low to medium cost alternative at sites where active remediation is required. Therefore, this alternative is considered an economically feasible option to address the source soils described above. Considering all required work associated with implementing this alternative (from design through remedial action completion), the estimated cost for this alternative ranges from $250,000 to $350,000.

Summary: This alternative will accomplish risk reduction objectives for the impacted soils at the site with a high degree of success. This alternative will help reduce a source of contaminants to the groundwater. In addition, environmental benefits will be realized in a timely manner making this alternative a feasible remedial option for the Site.

2.2.2 Alternative #2 – In-Situ Chemical Oxidation

Physical/Operations Description: The portion of source soil and tarry residues that is not accessible for excavation may be treated using in-situ chemical oxidation (ISCO). The ISCO alternative involves injecting chemicals into the subsurface which will oxidize VOC and PAH contamination; thus converting the contaminants into innocuous compounds. ISCO utilizes chemical reactions, such as Fenton's chemistry, to create free radicals in the subsurface which react with organic compounds. The chemicals are introduced into the subsurface by injection through permanent injection wells, by injection through temporary direct push borings, or by placing them into an excavation prior to backfilling. The number and frequency of application points, along with the depths of the injections in the impacted soil, are determined based on contaminant concentrations and soil types. A typical time frame is weeks to months for the chemical reaction from one application to be completed.

ISCO is generally effective on contaminants dissolved in the groundwater and is less effective for NAPL or contamination adhered to soil. Bench scale and pilot scale treatability tests will be needed to evaluate ISCO performance on the tarry residues at the site. Surfactants, heat, and/or bubbles released from the chemical reaction can help to move contaminants from soils into groundwater where ISCO is more effective. Depending on the ISCO technology and chemicals selected, one to five rounds of treatment may be necessary to reduce NAPL and soil PAH and VOC concentrations.

Technical Feasibility: This alternative has been used at other MGP sites and is considered technically feasible. The tarry residues in the source soil at the site may respond to multiple ISCO applications. High groundwater pH at the site may limit the effectiveness of some reagents. Other limitations include the organic content of the soil at the site (wood chip and saw dust) which will consume some of the oxidant. This alternative would not be appropriate to treat the tarry material located along and at the terminus of the clay pipe due to the large volume of oxidant which would be required in that area. Bench scale tests need to be conducted to determine the safest and most effective oxidant to use at the site, and to develop cost estimates for pilot and full-scale remediation. Based on the bench scale test results, a pilot test may be conducted at the site to confirm the effectiveness of the selected chemistry. If the results are successful, then a full scale injection program may be initiated.

Economic Feasibility: This alternative may be economically feasible to treat source soil inaccessible to excavation depending on the number of injection rounds needed. Cost estimates will be determined based on the results of bench and pilot scale testing.

Summary: This alternative requires further bench and pilot scale studies to determine reagents, costs, and effectiveness. This alternative can help reduce the source of contaminants to the groundwater. This alternative provides flexibility to inject in specific areas where treatment is needed the most, and can be conducted in conjunction with soil excavation. In addition, environmental benefits will be realized in a timely manner making this alternative a feasible remedial option for the Site.

2.2.3 Alternative #3 – In Situ Thermal Treatment of Source Soil

Physical/Operations Description: This alternative involves a process where chemicals in the soil are volatilized by applying an electrical resistance heating system to the area of impacted soil and concurrently recovering the vapors by soil vapor extraction (SVE) methods. The chemicals recovered by the SVE system may require treatment by catalytic oxidation or carbon adsorption prior to discharging the air stream to the atmosphere. This method includes the installation of vertical and/or horizontal piping systems (by vertical and/or horizontal

drilling methods with some near surface excavation). Thermal treatment would boil away ground water in saturated deposits and also heat the vadose zone. The energy required depends in part on how fast groundwater re-enters the treatment zone. A temporary building would be required to shelter the SVE equipment for continuous operation and the site would have to be secured to avoid accidental contact with electrical equipment by the public.

Other activities associated with this alternative are design and specifications development, subcontractor bidding and coordination, permitting, operation and maintenance, soil verification sampling, system decommissioning, final site restoration, reporting, and closure documentation.

Technical Feasibility: This alternative would be capable of addressing source soils that are not accessible using *ex-situ* methods, such as excavation. The thermal treatment equipment and accompanying SVE system would require numerous above-ground utilities which would be difficult to protect in some site areas due to road and rail traffic. In addition, this alternative would be most effect on VOCs, and would not be effective on PAH compounds due to their high boiling points.

Economic Feasibility: Installation and operation of this energy-intensive system is typically a high cost alternative. Anticipated costs are roughly three to five times higher than excavation and removal on a unit cost basis. The widespread distribution of source soils in thin layers would not optimize the effect of heating.

Summary: This alternative will accomplish the treatment and risk reduction objectives for VOCs in the source soil, but would not be effective for PAH contamination. The technical challenges and the high capital and O&M costs to achieve the remediation goals do not make this alternative an attractive remedial option for the site.

2.2.4 Alternative #4 – Engineered Barrier Enhancements

Physical/Operations Description: This alternative involves installing an engineered concrete or asphalt cover over all areas with contaminant concentrations that pose a risk to human health. The cap would protect human health by eliminating pathways for direct contact with impacted soil and groundwater. The cap would also prevent infiltration and percolation of surface water through the soil and prevent the continued transport of contaminants into the groundwater. The cap may also reduce volatilization of contaminants to ambient air. The placement of the cap would require a surface that is a minimum of 1.5 inches thick, with greater thickness in areas of heavier and more frequent traffic. Current and future property owner(s) would be required to maintain the integrity of the surface on a regular basis, in accordance with a maintenance plan (developed by the property owner and/or consultant). Currently, the source area is covered by grass or gravel.

Technical Feasibility: Use of an engineered cap would reduce future infiltration and percolation of surface waters through the source area; however, it will not greatly reduce the current impacts to the groundwater. Soil contaminants currently are in direct contact with the groundwater. Therefore, without active soil remediation, the impacted soil will continue to serve as a source of groundwater contamination. In addition, the engineered cap will not reduce the volatilization to indoor air exposure pathway. Any utility construction to service new development on the property would require proper management of impacted soil. Consequently, maintaining the residually impacted soil at the Site may not significantly reduce future long-term liability.

Economic Feasibility: The cost to implement the placement and maintenance of an engineered cap are relatively low. However, future management of soil may add significant long-term liability and cost to the current and/or future owner(s).

Summary: Although this is a low cost method, there would be minimal reduction to future groundwater contamination, it would not reduce exposure to the volatilization to indoor air pathway, and long-term liability for the current responsible parties would not be significantly reduced. The engineered cap would address the direct contact exposure pathway and the help reduce the volatilization to ambient air pathway. The engineered

cap may be useful in conjunction with other technologies used to treat source soils, but would have limited value as a stand-alone remedy at this site.

2.2.5 Alternative #5 – No Action

The no action alternative would include leaving the source soils in place. However, it is unknown if the contaminants would eventually degrade to acceptable levels. This alternative involves no costs for addressing the problem and has no limitations for implementation. Although technically and economically feasible, this alternative does not eliminate or reduce the existing risks and will not lead to site closure under WDNR rules.

3.0 Selected Remedial Action

The overall objective for implementing a remedial strategy at the Site is to realize a significant risk reduction benefit by removing or treating soil containing tarry residues that are a long-term source of groundwater contaminants. Without the continuing contribution of contaminants from source soils, monitored natural attenuation will effectively remediate groundwater.

Based on the evaluation of the various remedial alternatives presented, the following remedial actions have been selected:

1. Excavation and disposal of source soil located along and at the terminus of the clay pipe.
2. ISCO to treat source soils, as necessary.
3. Monitored natural attenuation to reduce dissolved concentrations in the groundwater.

The source soil removal will eliminate the direct contact risk and will aid in improving groundwater quality in the immediate area and downgradient of the excavation. The excavation will reduce human health risk immediately and is economically feasible. Soil samples will be collected for waste characterization prior to disposal. Excavation is not feasible along the railroad tracks or where thin source soil layers are deep below the ground surface. The estimated cost of excavation is $250,000 to $350,000.

After source soil removal, tarry residues that are inaccessible to excavation will be evaluated for treatment using ISCO. ISCO of the tarry residue as identified by soil sampling and the TarGOST survey could reduce the source of contaminants and could reduce the dissolved VOC and PAH concentrations in groundwater. Potentially, ISCO could reduce risk after one or more applications of a selected oxidant. Design and costs for the ISCO remedy will require bench and pilot scale treatability testing. Soil samples will be collected during the soil excavation in the source area. Bench scale study will be conducted on the soil samples to determine the most feasible and effective oxidant and oxidant demand. Based on the results of the bench scale study, an oxidant may be selected and a pilot study may be completed at the site. If the results of the pilot study indicate that the oxidant performed well, then a larger scale ISCO may be initiated, to the extent that it feasibly meets overall remedial objectives. More than one injection of reagent may be needed in some areas to achieve the remedial goals. ENSR has identified the following candidates for the bench scale study:

- Cool-Ox™, a proprietary blend by Deep-Earth Technology. According to Deep-Earth Technology, Cool-Ox generates hydrogen peroxide from solid peroxygens that are injected into the soil or groundwater in an aqueous suspension. Once in place, the peroxygens react with water to produce hydrogen peroxide. Metal catalysts are not needed for the reaction to occur, the reaction can occur in alkaline environments, and heat is not generated during the reaction.
- VeruTec Technologies, Inc. combines surfactant and oxidant chemistries using a controlled dissolution and desorption process (by dilute surfactant mixtures) with concomitant chemical destruction processes. VeruSOL® is a proprietary surfactant specifically designed for MGP byproducts which is combined with traditional oxidant chemistries, such as Fenton's.
- Geo-Cleanse® International, Inc. utilizes sodium persulfate for chemical oxidation, which is effective at high pH environments. Also, the sulfate from the persulfate can be utilized during aerobic biodegradation of the residual contaminants after treatment.
- In-Situ Oxidative Technologies, Inc (Isotec) utilizes liquid hydrogen peroxide and a site-specific patented chelated iron catalyst mixed to the same pH as the groundwater. ISOTEC injects stabilized 12% hydrogen peroxide followed by the chelated iron catalyst into the subsurface.

After source soil removal/treatment, monitored natural attenuation will be the final stage of the remedy for groundwater. Natural attenuation is defined by the US Environmental Protection Agency as "the biodegradation, dispersion, dilution, sorption, volatilization, and/or chemical and biochemical stabilization of contaminants to effectively reduce contaminant toxicity, mobility, or volumes to levels that are protective of human health and the ecosystem" (Brady, et al., 1997). Contaminants present in soil and groundwater will attenuate via naturally occurring biotic and abiotic processes. Natural attenuation processes and rates of contaminant degradation will be monitored by changes in contaminant concentration versus time and hydro-geochemical parameters of the affected aquifer.

Patterns consistent with natural attenuation have been observed on-site by the detection of low dissolved oxygen and ORP in monitoring wells located within the source area thereby indicating that natural biodegradation is taking place. The presence of petroleum-related compounds (site fingerprinting analytical results indicated an unresolved complex petroleum mixture) will provide bioavailable carbon to assist in the natural attenuation process.

Remediation by natural attenuation for the groundwater will be considered successful if the contaminant plume is stable or receding and VOC/PAH and geochemical indicator data provide evidence that natural attenuation is occurring at a rate sufficient to protect human health and the environment. Post-remediation groundwater monitoring will be conducted quarterly for two years to determine concentration trends and to verify that conditions conducive to natural attenuation are present at the site. Upon the successful demonstration of monitored natural attenuation, site closure documentation will be prepared for submittal to WDNR. The estimated cost for monitored natural attenuation and site closure documentation is $150,000 to $200,000.

Superior Water Light & Power
Former MGP Site
East 1st Street and Water Street
Superior, Wisconsin

Remedial Action Options Report
WDNR BRRTS #02-16-275446

Certification - Professional Geologist/Hydrogeologist

I, William M. Gregg, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03 (1), Wis. Adm. Code and a registered professional geologist in the State of Wisconsin, registered in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct, per ch. GHSS 5 of the Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code.

William M. Gregg
Signature

2/5/08
Date

Seal

Superior Water Light & Power
Former MGP Site
East 1st Street and Water Street
Superior, Wisconsin

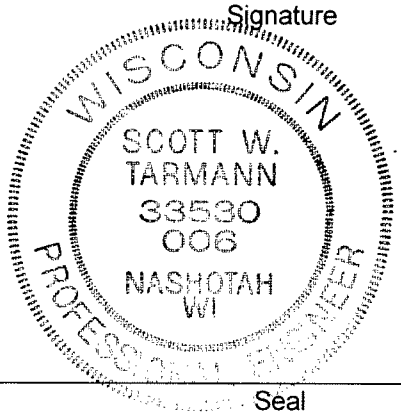
Remedial Action Options Report
WDNR BRRTS #02-16-275446

Certification - Professional Engineer

I, Scott Tarmann, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code.

Scott Tarmann
Signature

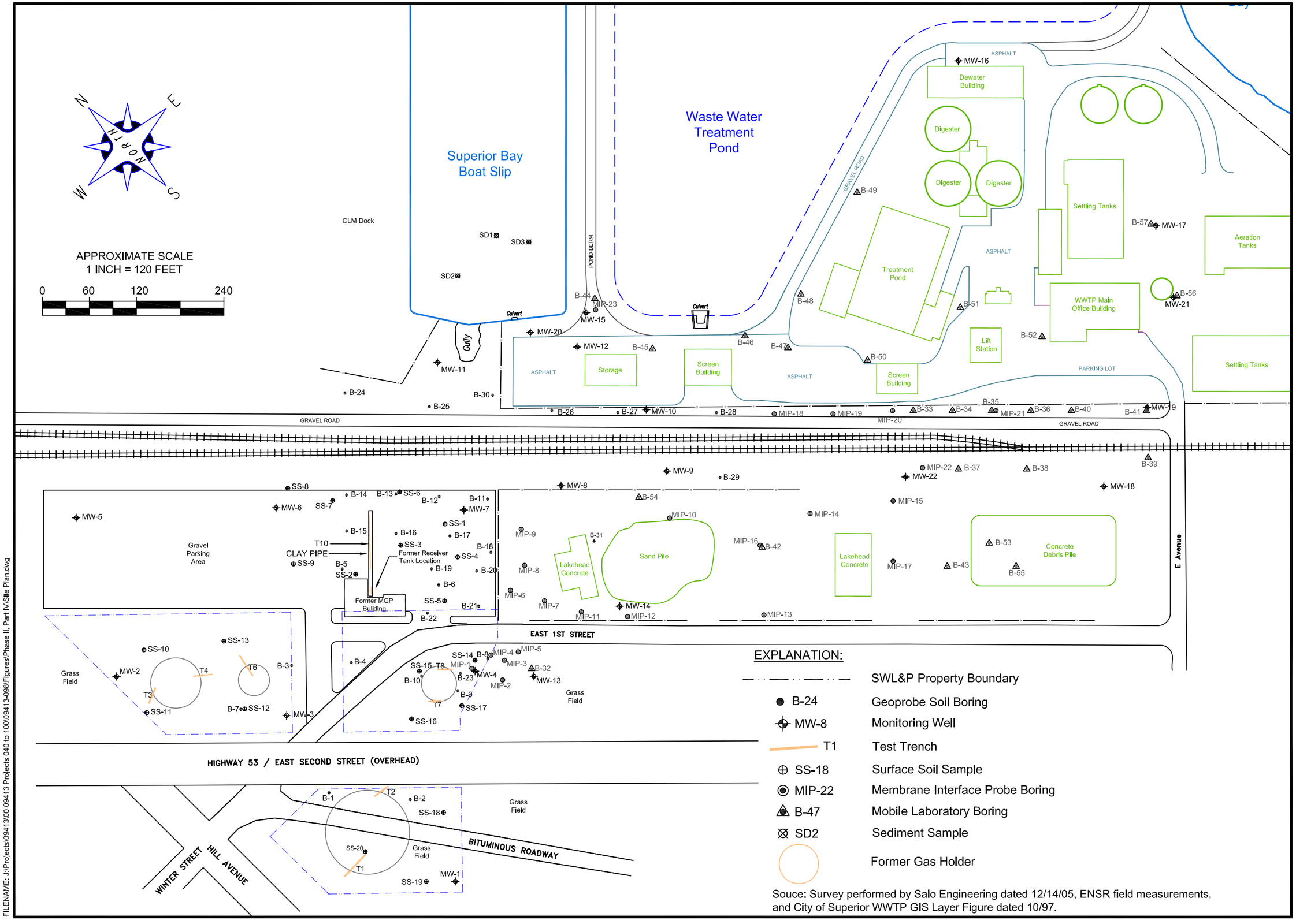
1/31/08
Date



Seal

Figures

Scale: 1 : 24,000	USGS 7½ Minute Topographic Quadrangle from DeLorme Superior, Wisconsin, 1993	**Site Location** Superior Water Light & Power Former MGP Superior, Wisconsin May 2007 Job No. 09413-098-600	**Figure 1** www.ensr.aecom.com



EXPLANATION:

- SWL&P Property Boundary
- B-24 Geoprobe Soil Boring
- MW-8 Monitoring Well
- T1 Test Trench
- SS-18 Surface Soil Sample
- MIP-22 Membrane Interface Probe Boring
- B-47 Mobile Laboratory Boring
- SD2 Sediment Sample
- Former Gas Holder

Souce: Survey performed by Salo Engineering dated 12/14/05, ENSR field measurements, and City of Superior WWTP GIS Layer Figure dated 10/97.

REVISIONS	NO.:	DESCRIPTION:	DATE:	BY:

DESIGNED BY:
DRAWN BY: CMBC
CHECKED BY: WMG
APPROVED BY: WMG

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SITE PLAN

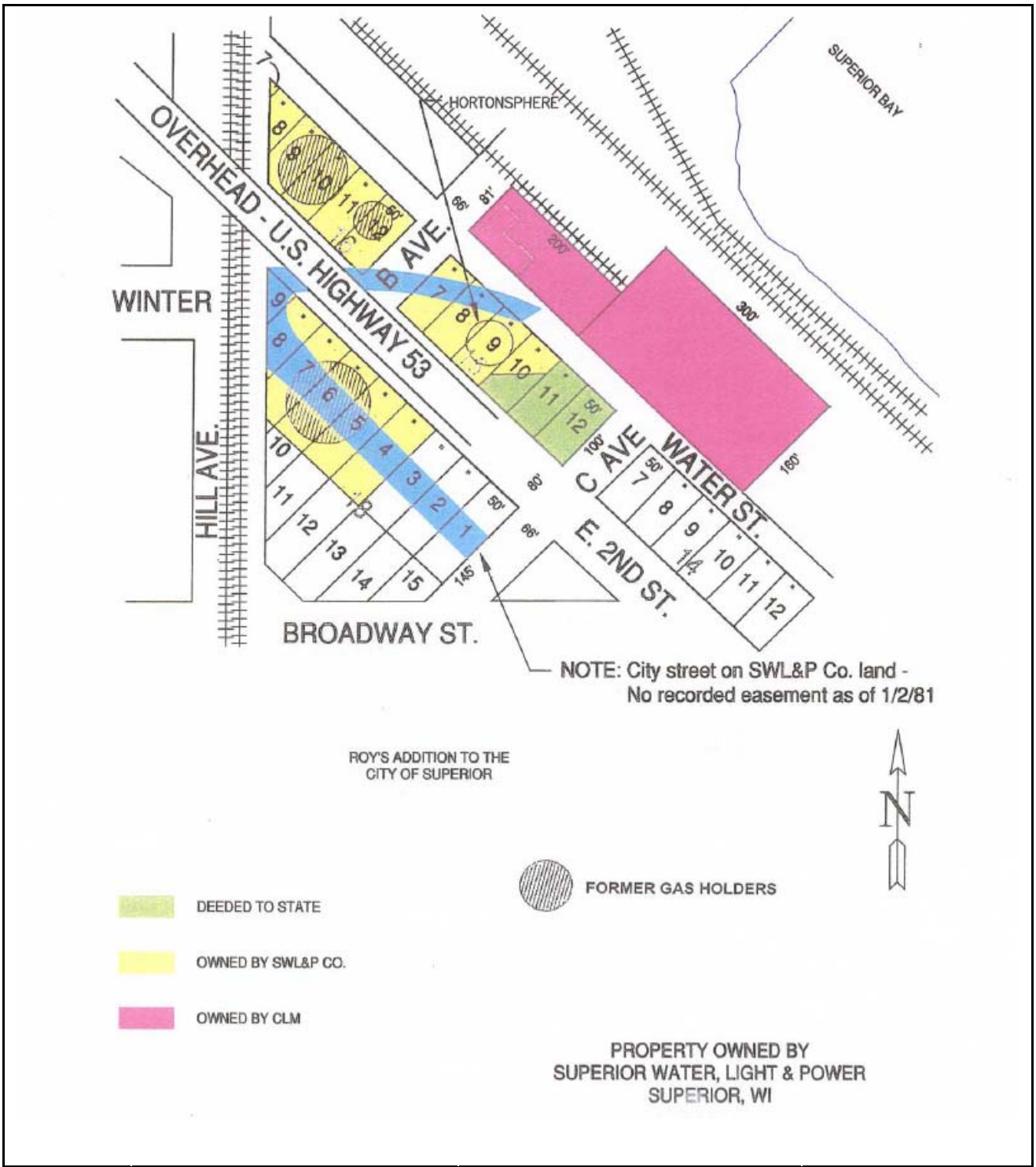
Phase II, Part IV Investigation
Superior Water Light & Power MGP
Superior, Wisconsin

PROJECT NUMBER: 09413-098-600
DATE: 4/9/07
SCALE: 1" = 120'

FIGURE NUMBER: 2

SHEET NUMBER: 1

FILENAME: J:\Projects\09413\00 09413 Projects 040 to 100\09413-098\Figures\Phase II, Part IV\Site Plan.dwg



Scale: 1 " = 190'

USGS 7½ Minute Topographic
Quadrangle from DeLorme

Superior, Wisconsin, 1993

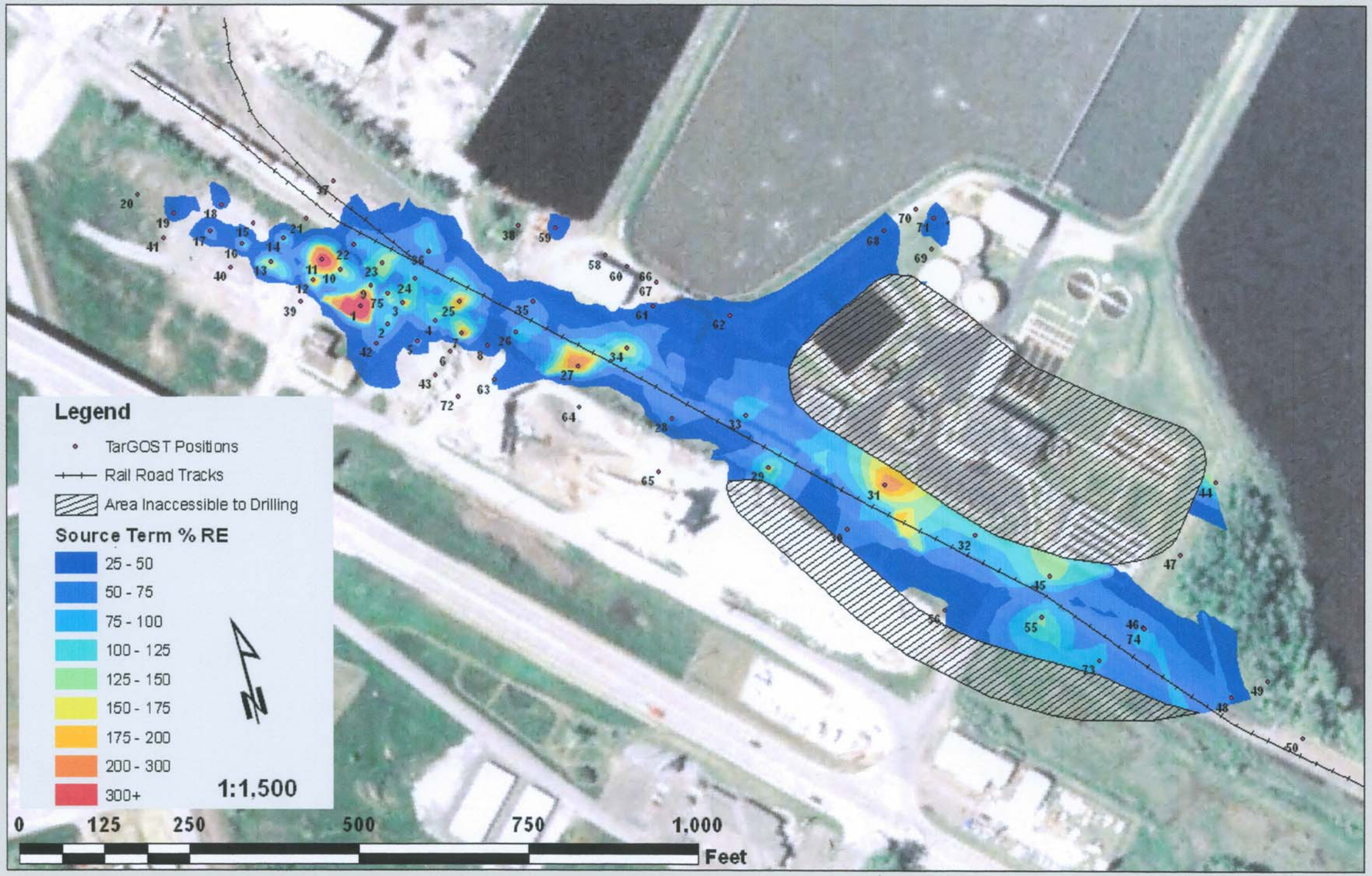
Property Ownership

Superior Water Light & Power
Former MGP
Superior, Wisconsin

May 2007 Job No. 09413-098-600

Figure 3

www.ensr.aecom.com



Note: The TarGOST modeling to produce this figure was completed by Dakota Technologies, Inc.

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ESTIMATED EXTENT TARRY MATERIALS IDENTIFIED BY TARGOST

Superior Water Light & Power MGP
Superior, Wisconsin

SCALE: 1" = 120'
DATE: 4/9/07
PROJECT NUMBER: 09413-098-600

FIGURE NUMBER: 4

SHEET NUMBER: 1

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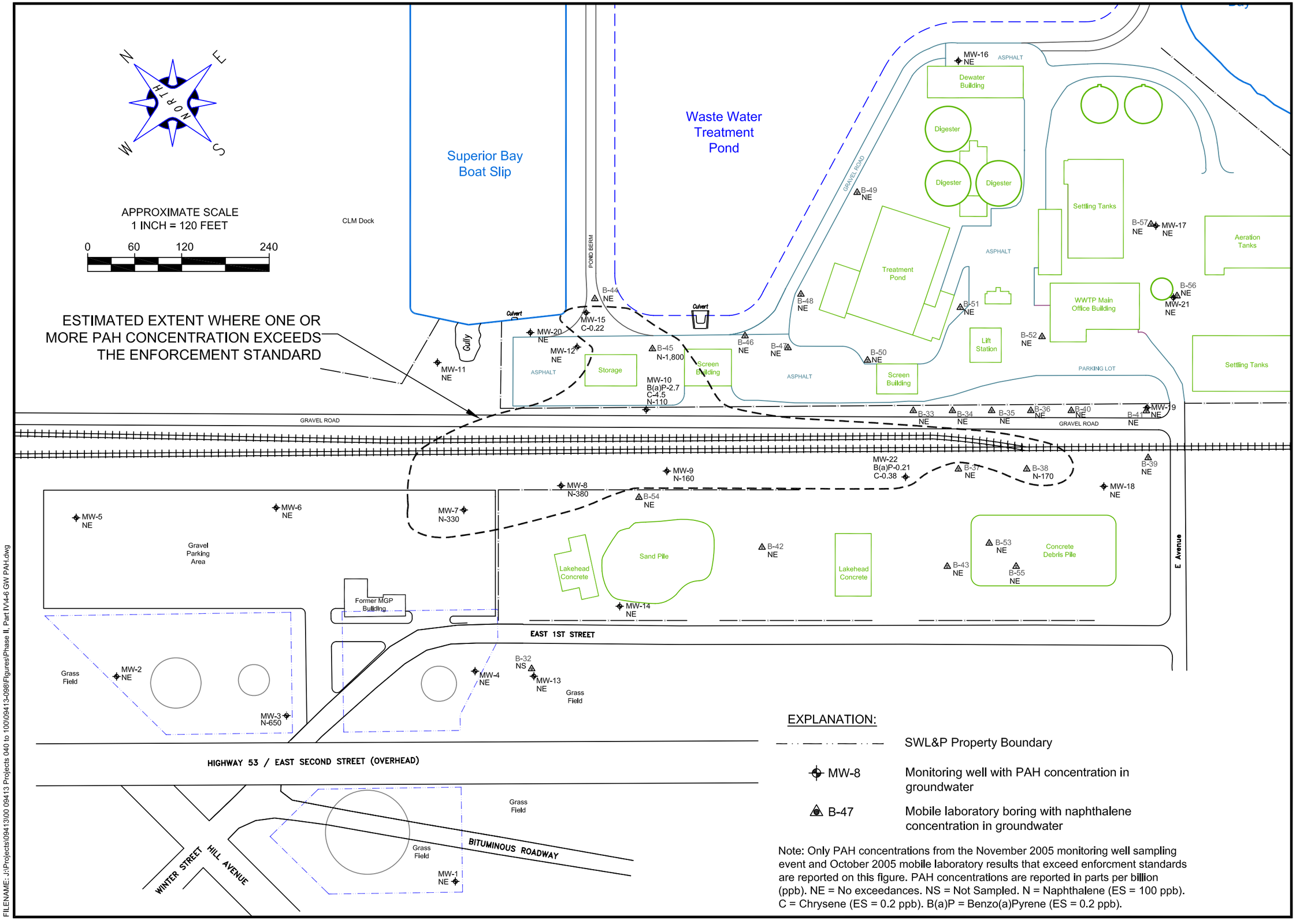

EXPLANATION:

SWL&P Property Boundary	
MW-8	Monitoring well with PAH concentration in groundwater
B-47	Mobile laboratory boring with naphthalene concentration in groundwater

Note: Only PAH concentrations from the November 2005 monitoring well sampling event and October 2005 mobile laboratory results that exceed enforcment standards are reported on this figure. PAH concentrations are reported in parts per billion (ppb). NE = No exceedances. NS = Not Sampled. N = Naphthalene (ES = 100 ppb). C = Chrysene (ES = 0.2 ppb). B(a)P = Benzo(a)Pyrene (ES = 0.2 ppb).

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DRAWN BY: CMBC
CHECKED BY: WMG
APPROVED BY: WMG

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SUMMARY OF PAH GROUNDWATER ANALYTICAL RESULTS

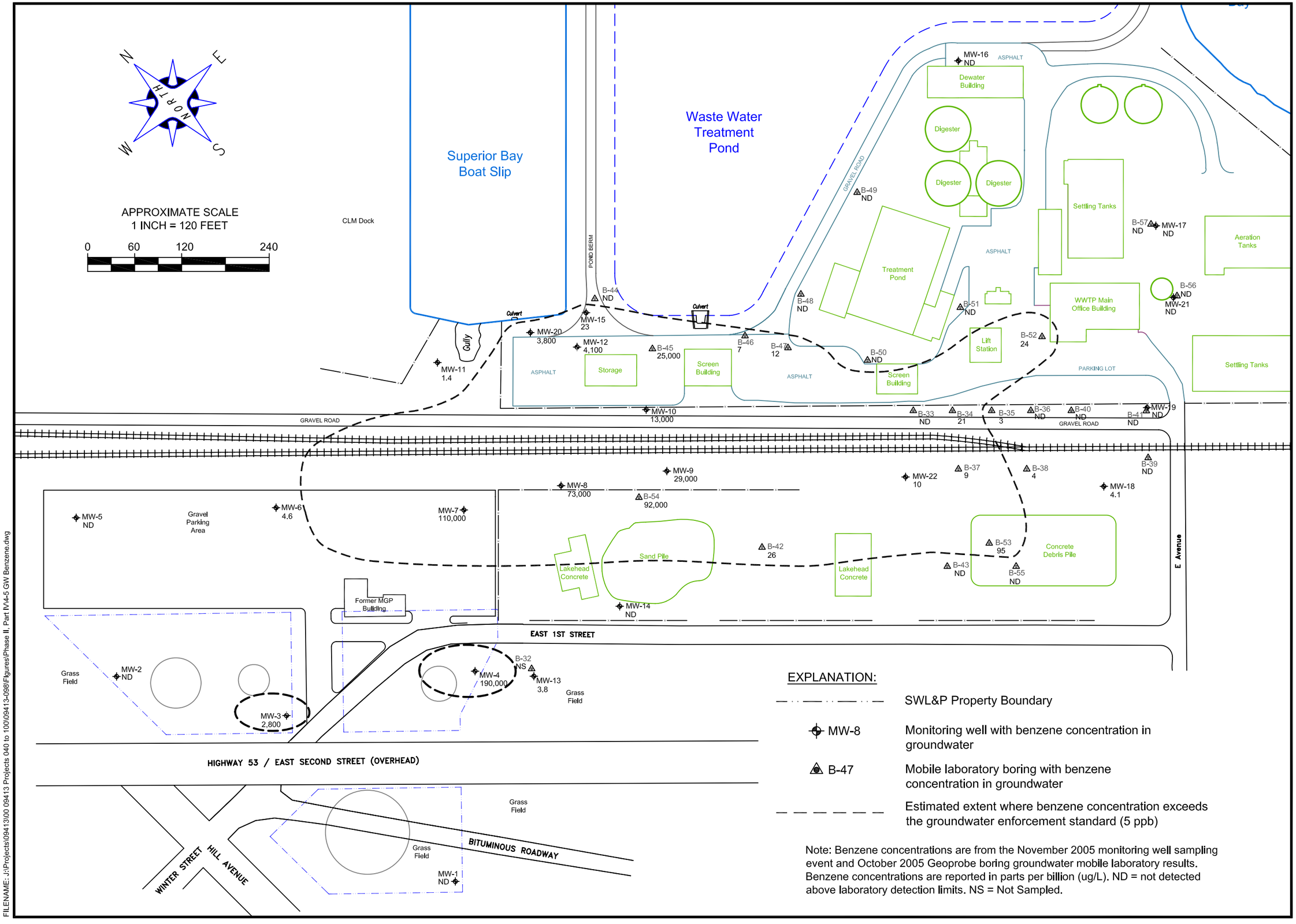
Superior Water Light & Power MGP
Superior, Wisconsin

PROJECT NUMBER: 09413-098-600
DATE: 4/9/07
SCALE: 1' = 120'

FIGURE NUMBER: 5

SHEET NUMBER: 1

FILENAME: J:\Projects\09413\00 09413 Projects 040 to 100\09413-098\Figures\Phase II, Part IV\4-6 GW PAH.dwg



EXPLANATION:

— · — · — · —	SWL&P Property Boundary
MW-8	Monitoring well with benzene concentration in groundwater
B-47	Mobile laboratory boring with benzene concentration in groundwater
– – – – – –	Estimated extent where benzene concentration exceeds the groundwater enforcement standard (5 ppb)

Note: Benzene concentrations are from the November 2005 monitoring well sampling event and October 2005 Geoprobe boring groundwater mobile laboratory results. Benzene concentrations are reported in parts per billion (ug/L). ND = not detected above laboratory detection limits. NS = Not Sampled.

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DRAWN BY: CMBC
CHECKED BY: WMG
APPROVED BY: WMG

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ESTIMATED EXTENT OF BENZENE PLUME IN GROUNDWATER

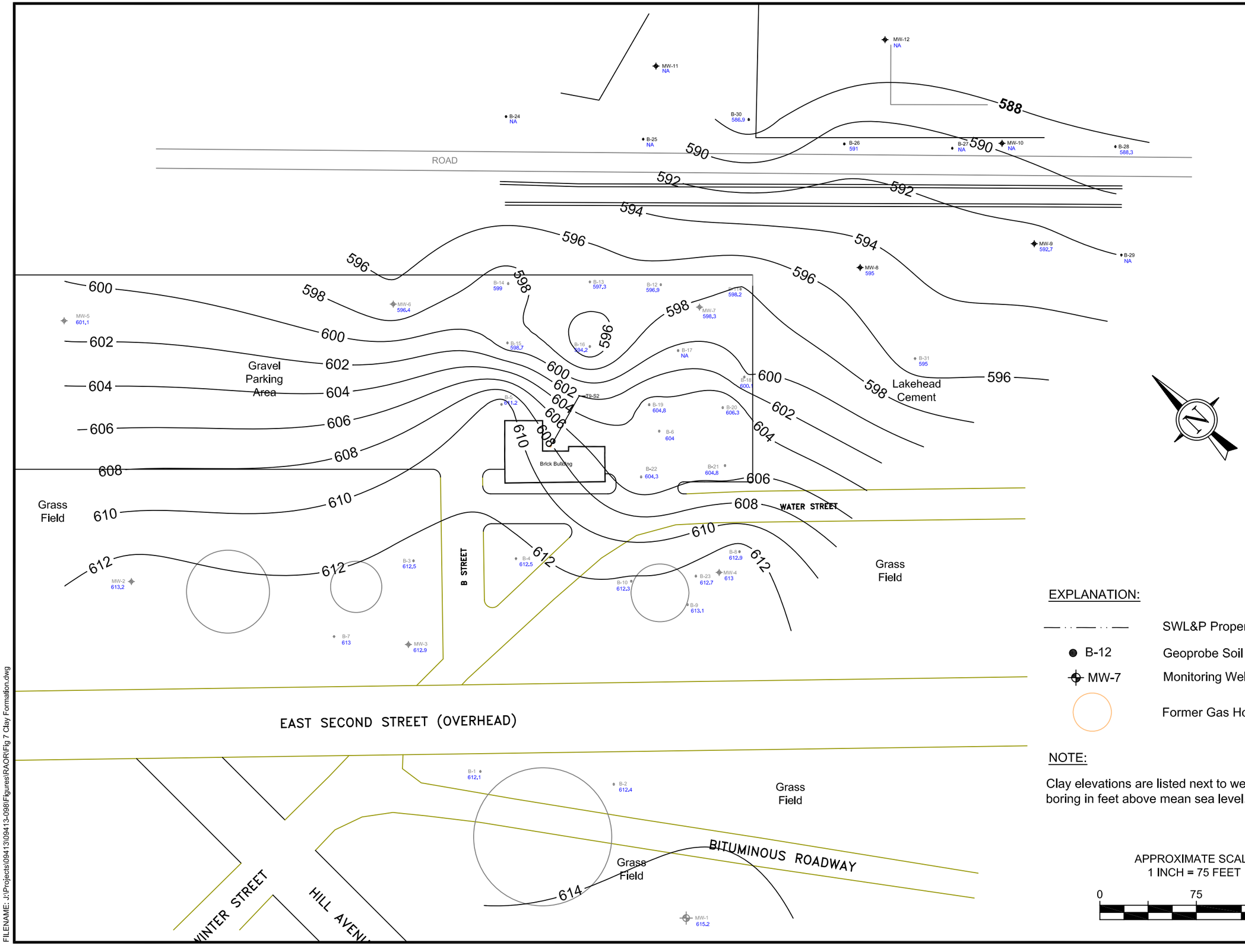
Superior Water Light & Power MGP
Superior, Wisconsin

PROJECT NUMBER: 09413-098-600
DATE: 4/9/07
SCALE: 1' = 120'

FIGURE NUMBER: 6

SHEET NUMBER: 1

FILENAME: J:\Projects\09413\00 09413 Projects 040 to 100\09413-098\Figures\Phase II, Part IV\4-5 GW Benzene.dwg



EXPLANATION:

- SWL&P Property Boundary
- B-12 — Geoprobe Soil Boring
- MW-7 — Monitoring Well
- Former Gas Holder

NOTE:

Clay elevations are listed next to well or boring in feet above mean sea level.

APPROXIMATE SCALE
1 INCH = 75 FEET

0 75 150

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APPROXIMATE ELEVATION OF CLAY SOIL

RAOR
SWL&P FORMER MGP
WINTER STREET & EAST 1ST STREET
SUPERIOR, WISCONSIN

SCALE:	DATE:	PROJECT NUMBER:
1" = 75'	10/17/07	09413-098

FIGURE NUMBER: 7

SHEET NUMBER: 1

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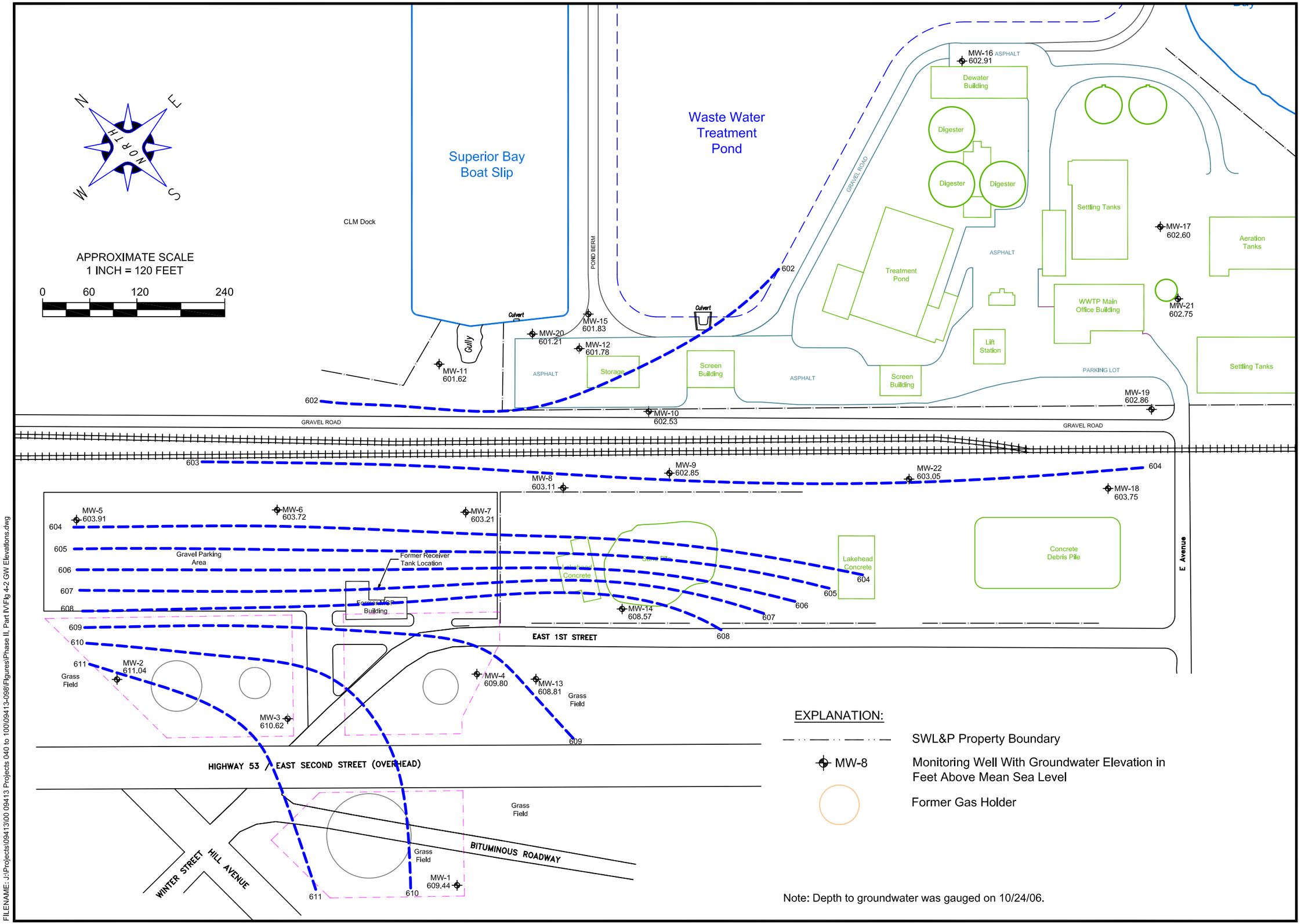

EXPLANATION:

- SWL&P Property Boundary
- MW-8 — Monitoring Well With Groundwater Elevation in Feet Above Mean Sea Level
- Former Gas Holder

Note: Depth to groundwater was gauged on 10/24/06.

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DRAWN BY: CMBC
CHECKED BY: WMG
APPROVED BY: WMG

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GROUNDWATER ELEVATIONS

RAOR
Superior Water Light & Power MGP
Superior, Wisconsin

PROJECT NUMBER: 09413-098-600
DATE: 4/9/07
SCALE: 1" = 120'

FIGURE NUMBER: 8

SHEET NUMBER: 1

FILENAME: J:\Projects\09413\00 09413 Projects 040 to 100\09413-098\Figures\Phase II, Part IV\Fig 4-2 GW Elevations.dwg

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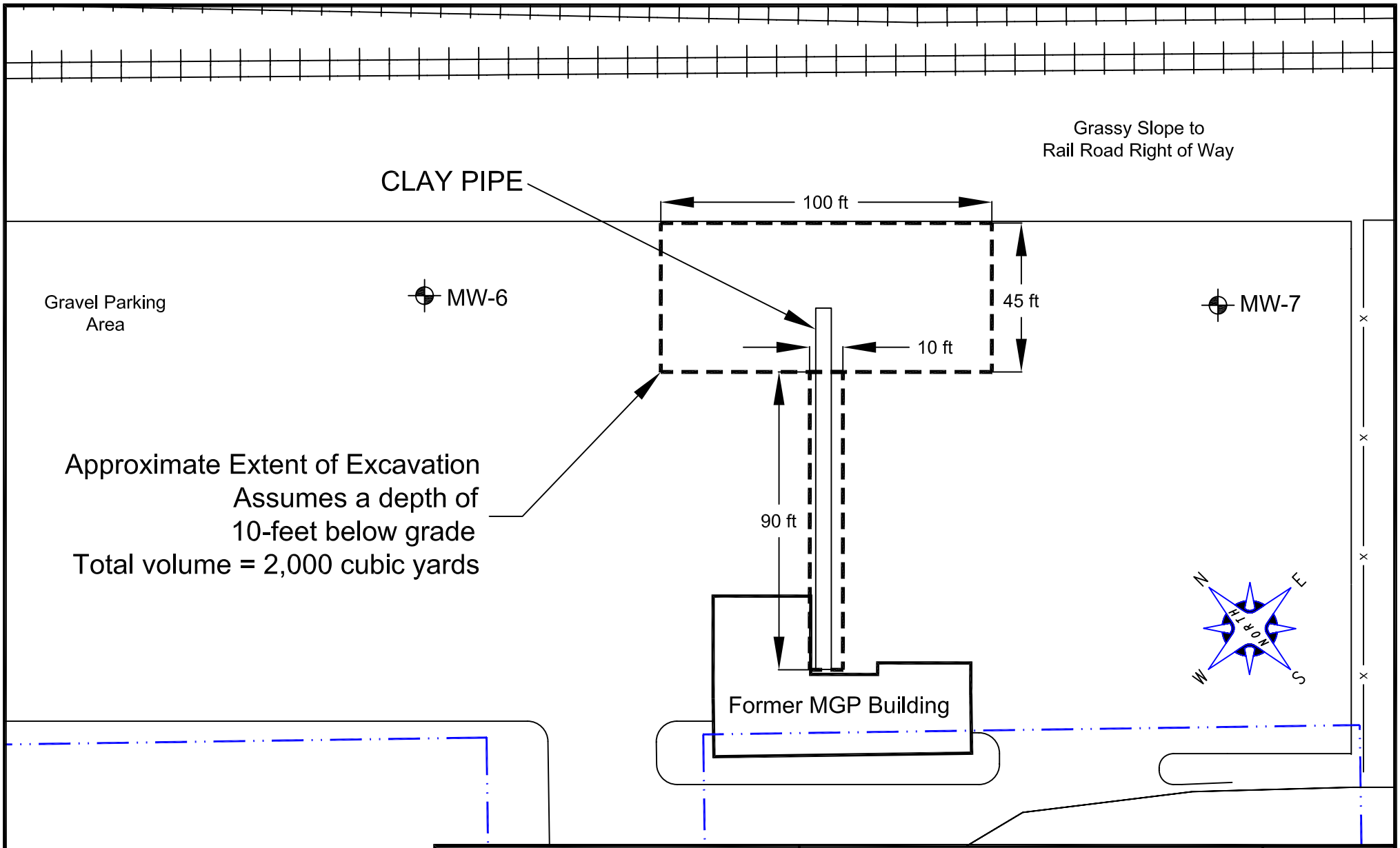

APPROXIMATE SCALE
1 INCH = 40 FEET

0 20 40 80

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APPROXIMATE EXTENT OF EXCAVATION

RAOR
SWL&P FORMER MGP
WINTER STREET & EAST 1ST STREET
SUPERIOR, WISCONSIN

FIGURE NUMBER: 9

DRAWN BY:	DATE:	PROJECT NUMBER:	SHEET NUMBER:
CMBC	10/12/07	09413-098	1

Tables

Table 1
Summary of Surface Soil Results
Superior Water, Light and Power Former MGP
Superior, Wisconsin

Sample ID *Sample Depth*	**WDNR Soil Standards** [a]	**B-15-1-3** **1-3'**	**MW-13** **3-4'**	**MW-17** **2-3'**	**MW-20** **2-3'**	**SS-1** **0-2'**	**SS-2** **0-2'**	**SS-3** **0-2'**	**SS-4** **0-2'**	**SS-5** **0-2'**	**SS-6** **0-2'**	**SS-7** **0-2'**	**SS-8** **0-2'**	**SS-8 DUP** **0-2'**	**SS-9** **0-2'**	**SS-10** **0-2'**	**SS-11** **0-2'**	**SS-12** **0-2'**	**SS-13** **0-2'**
VOC																			
Benzene	**1,100**	**21,000**	<32	<50	280	310	68	260	<25	**5,600**	1,000	150	80	78	<25	**2,300**	<25	<26	310
Chloromethane	**NE** [c]	--	**--**	--	--	<25	<25	<25	<25	130	<25	<25	<25	<26	<25	<26	<25	<26	<25
Ethylbenzene	**NE**	5,100	<32	<50	48	<25	41	<25	<25	150	220	130	<25	39	<25	210	<25	<26	350
Isopropylbenzene	**NE**	160	**--**	--	--	<25	<25	<25	<25	98	<25	<25	<25	<26	<25	<26	<25	<26	<25
N-Butylbenzene	**NE**	--	**--**	--	--	<25	<25	<25	<25	53	<25	<25	<25	<26	<25	<26	<25	<26	<25
n-Propylbenzene	**NE**	--	**--**	--	--	<25	<25	<25	<25	87	<25	<25	<25	<26	<25	<26	<25	<26	<25
p-Isopropyltoluene	**NE**	--	<32	<50	<45	<25	<25	<25	<25	42	<25	<25	<25	<26	<25	<26	<25	<26	<25
sec-Butylbenzene	**NE**	--	**--**	--	--	<25	<25	<25	<25	37	<25	<25	<25	<26	<25	<26	<25	<26	<25
Styrene	**NE**	<50	**--**	--	--	<25	<25	<25	<25	<25	<25	<25	<25	<26	<25	47	<25	<26	<25
Toluene	**NE**	9,300	<32	<50	230	430	210	240	<25	3,100	920	440	97	88	<25	2,800	<25	38	390
1,2,4-Trimethylbenzene	**NE**	980	**--** [b]	--	--	<25	130	51	<25	390	56	150	<25	<26	<25	160	<25	<26	100
1,3,5-Trimethylbenzene	**NE**	460	**--**	--	--	<25	62	<25	<25	100	<25	99	<25	<26	<25	89	<25	<26	56
Xylene, o	**NE**	1,400	<32	<50	63	<25	170	71	<25	680	60	190	<25	<26	<25	330	<25	<26	150
Xylenes, m + p	**NE**	5,800	<64	<100	170	120	270	110	<50	1,100	330	510	<50	<51	<50	1,300	<50	<26	330
PAH																			
Acenaphthene	**60,000,000**	95Q	<3.9	<3.1	86	13	2,100	4.7	4.3	35	2,100	360	120	52	<3.5	400	<3.9	9.7	170
Acenaphthylene	**360,000**	920	<3.8	<3.0	41	<3.9	1,300	27	11	330	7,800	3,200	600	210	5	1,700	<3.8	210	4,800
Anthracene	**30,000,000**	350	<4.7	<3.8	220	<4.9	5,300	23	14	480	23,000	2,000	670	170	<4.2	1,100	10	68	1,100
Benzo(a)anthracene	**3,900**	1,600	10	7.4	410	<7.3	**9,500**	57	31	2,000	**28,000**	**5,100**	1,700	450	8.8	1,100	25	140	1,400
Benzo(a)pyrene	**390**	**1,900**	10	9.5	**410**	<3.9	**9,100**	55	24	**2,300**	**23,000**	**4,500**	**1,800**	**630**	10	**2,500**	26	280	**4,800**
Benzo(b)fluoranthene	**390**	**1,700**	7.9	7.5	320	<3.8	**7,700**	52	22	**2,000**	**17,000**	**3,100**	**1,100**	**400**	7.7	**1,300**	24	140	**2,100**
Benzo(ghi)perylene	**39,000**	1,900	6.9	7.3	130	<4.9	3,000	56	26	1,100	8,300	2,100	1,100	400	11	1,600	17	210	3,100
Benzo(k)fluoranthene	**39,000**	1,800	8.5	7.6	340	<4.2	8,100	48	28	1,800	20,000	4,200	1,400	440	7.8	1,800	20	150	2,500
Chrysene	**390,000**	2,200	11	8.8	410	<6.0	11,000	93	52	2,100	34,000	6,900	1,900	540	13	1,600	31	170	1,800
Dibenz(a,h)anthracene	**390**	**570**	<3.6	<2.9	41	<3.8	**1,400**	16	<3.8	**390**	**2,700**	**720**	260	110	<3.2	**460**	<3.6	60	**920**
Fluoranthene	**40,000,000**	1,600	20	11	950	<3.9	22,000	64	67	3,100	20,000	9,300	3,400	590	12	1,600	39	170	1,600
Fluorene	**40,000,000**	110	<4.5	<3.6	85	<4.7	2,400	12	<4.7	60	650	310	45	16	<4	99	<4.5	17	160
Indeno(1,2,3-cd)pyrene	**3,900**	1,400	5	5.8	130	<3.4	3,100	35	18	1,000	**6,800**	1,600	760	290	7.3	1,100	13	150	2,200
1-Methylnaphthalene	**70,000,000**	860	<4.0	11	65	14	630	320	14	660	2,300	390	170	92	5.7	470	12	45	480
2-Methylnaphthalene	**40,000,000**	1,100	<4.1	14	79	9.1	910	420	25	820	5,800	740	350	170	8.7	910	19	67	750
Naphthalene [d]	**110,000**	--	<32	<50	200	<25	460	100	<25	940	3,200	1,800	500	290	<25	3,100	90	210	910
Naphthalene	**110,000**	840	<5.3	9.8	160	14	1,700	260	27	560	17,000	1,700	750	310	13	1,800	13	100	2,100
Phenanthrene	**390,000**	1,200	12	12	1,100	4.8	22,000	200	100	1,500	6,900	4,100	2,400	450	14	1,500	34	150	1,400
Pyrene	**30,000,000**	2,900	19	11	1,100	3.4	24,000	88	97	3,200	72,000	16,000	5,000	1,000	19	3,000	48	270	2,900

Notes:
Results are reported in parts per billion, or micrograms per kilogram (ug/kg).
Bold results indicate value exceeds Direct Contact RCL.
Only shallow soil samples (less than 4-feet deep) are reported in this table.
(a) Protection of Human Health from Direct Contact with Contaminated Soil (top 4 feet of soil), Table 2, NR 746 (VOCs only).
Soil Cleanup Levels of Polycyclic Aromatic Hydrocarbons Interim Guidance, WDNR Publication RR-519-97 (PAH only).
(b) -- indicates sample was not analyzed for this parameter.
(c) NE - Not Established.
(d) Analysis for naphthalene was performed using two analytical methods (8260 and 8270).

Table 1
Summary of Surface Soil Results
Superior Water, Light and Power Former MGP
Superior, Wisconsin

Sample ID *Sample Depth*	**WDNR Soil Standards** [a]	**SS-14** **0-2'**	**SS-15** **0-2'**	**SS-16** **0-2'**	**SS-17** **0-2'**	**SS-18** **0-2'**	**SS-19** **0-2'**	**SS-20** **0-2'**	**T1-S1** **1.5'**	**T1-S2** **2-2.5'**	**T2-S1** **2.5-3'**	**T7-S1** **3-3.5'**	**T8-S1** **3-4'**	**T9-S2** **2'**	**T9-S2 DUP** **2'**
VOC															
Benzene	**1,100**	**2,000**	39	<25	<25	<25	<26	33	390	<25	<25	<25	**240,000**	400	210
Chloromethane	**NE** [c]	<25	<25	<25	<25	<25	<26	<25	--	--	--	--	--	--	--
Ethylbenzene	**NE**	92	<25	<25	<25	<25	<26	<25	170	<25	<25	<25	<1,000	<25	<25
Isopropylbenzene	**NE**	<25	<25	<25	<25	<25	<26	<25	--	--	--	--	--	--	--
N-Butylbenzene	**NE**	<25	<25	<25	<25	<25	<26	<25	--	--	--	--	--	--	--
n-Propylbenzene	**NE**	<25	<25	<25	<25	<25	<26	<25	--	--	--	--	--	--	--
p-Isopropyltoluene	**NE**	<25	<25	<25	<25	<25	<26	<25	--	--	--	--	--	--	--
sec-Butylbenzene	**NE**	<25	<25	<25	<25	<25	<26	<25	--	--	--	--	--	--	--
Styrene	**NE**	<25	<25	<25	<25	<25	<26	<25	--	--	--	--	--	--	--
Toluene	**NE**	1,100	39	<25	<25	31	60	71	540	<25	<25	<25	150,000	650	270
1,2,4-Trimethylbenzene	**NE**	160	<25	<25	<25	<25	<26	33	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	**NE**	160	<25	<25	<25	<25	<26	<25	--	--	--	--	--	--	--
Xylene, o	**NE**	640	<25	<25	<25	<25	<26	50	340	<25	<25	<25	9,500	81	63
Xylenes, m + p	**NE**	1,600	<50	<50	<50	<50	<51	92	620	<25	<25	<25	18,000	240	180
PAH															
Acenaphthene	**60,000,000**	4.1	<4.3	<3.9	<4.1	16	27	<3.8	<280	<22	<21	<22	<22	<21	76
Acenaphthylene	**360,000**	19	<4.2	<3.8	<4	10	450	16	560	<16	<16	<16	<17	49	56
Anthracene	**30,000,000**	15	<5.1	<4.7	<4.9	39	550	23	<200	<16	<16	18	<16	35	210
Benzo(a)anthracene	**3,900**	42	20	<7	8.9	76	1,600	73	290	<18	<17	<18	<18	320	650
Benzo(a)pyrene	**390**	55	19	<3.8	8.6	77	**1,600**	78	250	<16	<16	<16	<17	**680**	**900**
Benzo(b)fluoranthene	**390**	36	15	3.9	7.3	57	**1,400**	64	**400**	<14	<14	<14	<15	**470**	**700**
Benzo(ghi)perylene	**39,000**	39	9.6	<4.7	5.4	36	500	45	420	<15	<15	<15	<15	540	620
Benzo(k)fluoranthene	**39,000**	43	18	<4	8.7	68	1,600	64	290	<17	<17	<17	<17	470	660
Chrysene	**390,000**	54	22	6.5	11	85	1,500	82	510	<18	<17	<18	<18	400	680
Dibenz(a,h)anthracene	**390**	8.2	<4	<3.6	<3.8	12	250	13	<190	<14	<14	<14	<15	160	200
Fluoranthene	**40,000,000**	59	35	8.7	16	180	3,200	130	610	<14	14	21	<14	420	1100
Fluorene	**40,000,000**	4.8	<4.9	<4.5	<4.7	16	35	6	<210	<16	<16	<16	<17	<16	80
Indeno(1,2,3-cd)pyrene	**3,900**	29	9	<3.3	4.5	33	510	39	430	<15	<15	<15	<15	490	610
1-Methylnaphthalene	**70,000,000**	68	4.8	5.2	4.5	33	74	39	2200	<18	<18	28	<19	<18	27
2-Methylnaphthalene	**40,000,000**	100	6.3	5.2	6.4	47	110	61	4,700	<16	<16	45	<16	25	44
Naphthalene [d]	**110,000**	130	<25	49	<25	82	160	180	--	--	--	--	--	--	--
Naphthalene	**110,000**	90	5.9	<5.3	6.5	51	150	88	15,000	<22	<22	130	58	55	91
Phenanthrene	**390,000**	55	15	6.1	11	160	760	76	870	<14	<14	54	<15	210	830
Pyrene	**30,000,000**	74	38	8.3	18	180	2,800	150	490	<16	<16	28	<16	480	1,000

Table 2a
Summary of Deep Phase II Soil Analytical Results
SWLP MGP
Superior, Wisconsin

Analyte	Units	WDNR Soil Standards [a]	T3-S1	T4-S1	T6-S1	T7-S2	T9-S1	B-1-8-10	B-2-8-10	B-3-6-8	B-3-20-22	B-4-8-10	B-5-8-10	B-5-8-10-DUP	B-6-8-10	B-7-8-10
Metals			8 Ft	6.5-7 Ft	8 Ft	5-6 Ft	5 Ft	8-10 Ft	8-10 Ft	6-8 Ft	20-22	8-10 Ft	8-10 Ft	8-10 Ft	8-10 Ft	8-10 Ft
Arsenic	mg/Kg	---	3.1	4.6	3.3	2.8	2.9	3.4	2.9	2.7	3.0	3.4	3.9	2.9	3.6	2.6
Barium	mg/Kg	---	62	88	170	200	140	250	210	160	120	170	140	100	220	150
Cadmium	mg/Kg	---	0.16	0.26	0.26	0.25	0.22	0.29	0.25	0.22	0.26	0.33	0.90	0.25	0.30	0.24
Chromium	mg/Kg	---	6.8	7.5	38	39	35	50	43	40	40	45	36	43	46	43
Lead	mg/Kg	---	7.3	32	19	8.4	8.4	12	8.9	7.4	10	10	43	8.4	11	7.8
Selenium	mg/Kg	---	1.9	2.2	0.41	0.46	0.33	0.38	0.62	0.53	0.36	0.50	0.29	0.47	0.66	0.45
Silver	mg/Kg	---	<0.27	<0.23	<0.20	<0.19	<0.19	<0.21	<0.20	<0.20	<0.21	<0.21	<0.19	<0.20	<0.21	<0.19
Mercury	mg/Kg	---	<0.0094	<0.0078	0.056	<0.0067	0.018	<0.0073	<0.0068	<0.0068	<0.0072	<0.0071	<0.0067	<0.0067	<0.0072	<0.0067
Cyanide, total	mg/kg	---	<0.44	<0.37	<0.32	<0.32	<0.31	<0.34	<0.32	<0.32	<0.34	<0.34	<0.32	<0.32	<0.34	<0.32
PAH																
1-Methylnaphthalene	ug/kg	23,000	<25	180	**99,000**	<18	44	<20	<18	**35,000**	<20	<19	<18	<18	<20	<18
2-Methylnaphthalene	ug/kg	20,000	<22	260	**150,000**	<15	82	<17	<16	**56,000**	<17	<17	<16	16	<17	<15
Acenaphthene	ug/kg	38,000	<30	<25	**77,000**	<21	<21	<23	<22	2,400	<23	<23	<21	<21	<23	<21
Acenaphthylene	ug/kg	700	<23	<19	**31,000**	<16	27	<18	<16	**9,900**	<17	<17	<16	<16	<17	<16
Anthracene	ug/kg	3,000,000	<22	35	65,000	<15	23	<17	<16	15,000	<17	<17	<16	<16	<17	<15
Benzo(a)anthracene	ug/kg	17,000	<24	57	**36,000**	<17	21	<19	<18	9,600	<19	<19	<17	<18	<19	<17
Benzo(a)pyrene	ug/kg	48,000	<23	36	28,000	<16	19	<18	<16	8,200	<17	<17	<16	<16	<17	<16
Benzo(b)fluoranthene	ug/kg	360,000	<20	36	16,000	<14	<14	<15	<14	3,200	<15	<15	<14	<14	<15	<14
Benzo(g,h,i)perylene	ug/kg	6,800,000	<21	24	14,000	<15	<15	<16	<15	3,300	<16	<16	<15	<15	<16	<15
Benzo(k)fluoranthene	ug/kg	870,000	<24	32	19,000	<17	20	<18	<17	5,300	<18	<18	<17	<17	<18	<17
Chrysene	ug/kg	37,000	<24	59	36,000	<17	23	<19	<18	8,500	<19	<19	<17	<18	<19	<17
Dibenzo(a,h)anthracene	ug/kg	38,000	<20	<17	4,200	<14	<14	<15	<14	950	<15	<15	<14	<14	<15	<14
Fluoranthene	ug/kg	500,000	<19	170	63,000	<14	36	<15	<14	17,000	<15	<14	<14	<14	<15	<14
Fluorene	ug/kg	100,000	<23	<19	48,000	<16	16	<18	<15	13,000	<17	<17	<16	<16	<17	<16
Indeno(1,2,3-cd)pyrene	ug/kg	680,000	<21	19	13,000	<15	<15	<16	<16	3,300	<16	<16	<15	<15	<16	<15
Naphthalene	ug/kg	400	<31	170	**66,000**	<22	110	<24	<22	**190,000**	<24	<23	<22	25	<24	57
Phenanthrene	ug/kg	1,800	<20	200	**170,000**	<14	91	<15	<14	**50,000**	<15	<15	<14	17	<15	<14
Pyrene	ug/kg	8,700,000	<22	120	88,000	<15	41	<17	<16	23,000	<17	<17	<16	<16	<17	<15
BTEX																
Benzene	ug/kg	5.5	<25	<25	**21,000**	<25	**250**	<25	<25	**42,000**	**1,500**	<25	<25	<25	**4,000**	**67**
Ethylbenzene	ug/kg	2,900	<25	<25	**160,000**	<25	220	<25	<25	**13,000**	<25	<25	<25	<25	<25	<25
Toluene	ug/kg	1,500	<25	41	**7,300**	<25	**2,200**	<25	<25	**76,000**	75	<25	<25	<25	<25	<25
Xylene, -o	ug/kg	4,100 [b]	<25	<25	**58,000**	<25	**3,000**	<25	<25	**37,000**	<25	<25	<25	<25	<25	<25
Xylenes, -m, -p	ug/kg	4,100 [b]	<25	42	**120,000**	<25	**6,400**	<25	<25	**73,000**	<25	<25	<25	<25	<25	<25
pH																
pH, Laboratory		NA	12.6	12.0	7.5	7.82	8.1	8.06	7.85	8.03	8.40	7.96	8.13	8.14	8.19	7.96

a. Residual Contaminant Levels (RCL) for Protection of Groundwater. No RCLs established for metals.
RCLs for PAH are from Table 1, Soil Cleanup Levels for PAHs Interim Guidance. RCL for BTEX are from Table 1, WAC NR 720.
b. The RCL for xylene is 4,100 ug/kg for the sum of all xylenes.

Note: Bold results indicate concentrations greater than applicable RCL.
Approximate sample depth beneath sample ID is reported in feet below grade.
Only deep soil samples (greater than 4-feet deep) are reported in this table.
Samples were collected for the Phase II Investigation (see Phase II Report dated January 2002).

Table 2a
Summary of Deep Phase II Soil Analytical Results
SWLP MGP
Superior, Wisconsin

Analyte	Units	WDNR Soil Standards [a]	MW-1-12-14	MW-2-12-14	MW-3-6-8	MW-4-8-10	MW-5-4-6	MW-6-8-10	MW-7-8-10	MW-7-8-10-DUP	MW-7-18-20
Metals			12-14 Ft	12-14 Ft	6-8 Ft	8-10 Ft	4-6 Ft	8-10 Ft	8-10 Ft	8-10 Ft	18-20 Ft
Arsenic	mg/Kg	---	3.2	2.9	2.7	3.3	6.2	2.5	4.5	7.7	3.4
Barium	mg/Kg	---	420	240	150	170	520	140	200	180	290
Cadmium	mg/Kg	---	0.29	0.24	0.21	0.28	0.64	0.22	0.39	0.44	0.28
Chromium	mg/Kg	---	43	39	35	40	15	28	9.7	11	41
Lead	mg/Kg	---	12	9.4	7.6	10.0	310	18	120	450	12
Selenium	mg/Kg	---	<0.30	0.41	0.34	0.54	2.1	<0.29	3.9	4.4	<0.29
Silver	mg/Kg	---	<0.22	<0.21	<0.19	<0.20	<0.23	<0.21	<0.24	<0.26	<0.22
Mercury	mg/Kg	---	0.018	0.014	0.0089	0.016	0.015	0.083	<0.0083	0.011	0.0094
Cyanide, total	mg/kg	---	<0.36	<0.34	<0.32	<0.34	<0.37	<0.34	<0.39	<0.43	<0.35
PAH											
1-Methylnaphthalene	ug/kg	23,000	<20	<19	2,100	<19	<21	200	1,000	2,400	<20
2-Methylnaphthalene	ug/kg	20,000	<17	<16	3,300	19	<18	290	1,700	3,400	<17
Acenaphthene	ug/kg	38,000	<24	<23	<210	<22	<25	640	750	1,500	<24
Acenaphthylene	ug/kg	700	<18	<17	390	<17	<19	620	**1,000**	**1,900**	<18
Anthracene	ug/kg	3,000,000	<17	<16	990	<16	<18	1,400	880	1,900	<17
Benzo(a)anthracene	ug/kg	17,000	<20	<18	810	<18	<21	3,300	1,300	2,700	<19
Benzo(a)pyrene	ug/kg	48,000	<18	<17	640	<17	<19	4,800	1,500	3,400	<18
Benzo(b)fluoranthene	ug/kg	360,000	<16	<15	300	<15	<17	1,800	880	1,900	<16
Benzo(g,h,i)perylene	ug/kg	6,800,000	<17	<16	280	<15	<18	3,700	1,100	3,000	<16
Benzo(k)fluoranthene	ug/kg	870,000	<19	<18	430	<17	<20	3,400	1,400	2,900	<19
Chrysene	ug/kg	37,000	<20	<18	740	<18	<21	4,200	1,900	4,200	<19
Dibenzo(a,h)anthracene	ug/kg	38,000	<16	<15	<140	<15	<17	650	<350	650	<16
Fluoranthene	ug/kg	500,000	<15	<14	1,200	<14	<16	9,000	2,700	6,000	<15
Fluorene	ug/kg	100,000	<18	<17	850	<17	<19	<180	660	1,400	<18
Indeno(1,2,3-cd)pyrene	ug/kg	680,000	<17	<16	250	<15	<18	3,300	1,000	2,700	<16
Naphthalene	ug/kg	400	<25	<23	**11,000**	<23	<26	**1,000**	**20,000**	**41,000**	<24
Phenanthrene	ug/kg	1,800	<16	<15	**3,500**	56	<17	**2,600**	**2,600**	**5,900**	<16
Pyrene	ug/kg	8,700,000	<17	<16	1,800	<16	<18	12,000	3,700	8,000	<17
BTEX											
Benzene	ug/kg	5.5	<25	<25	**2,800**	**160,000**	<25	**100**	**1,100,000**	**910,000**	**640**
Ethylbenzene	ug/kg	2,900	<25	<25	580	<500	<25	84	**28,000**	**25,000**	110
Toluene	ug/kg	1,500	<25	<25	**2,200**	**36,000**	<25	110	**1,200,000**	**1,100,000**	1,100
Xylene, -o	ug/kg	4,100 [b]	<25	<25	1,100	**1,600**	<25	49	**270,000**	**260,000**	270
Xylenes, -m, -p	ug/kg	4,100 [b]	<25	<25	2,300	**5,700**	<25	76	**380,000**	**360,000**	580
pH											
pH, Laboratory		NA	8.13	8.12	8.02	8.23	11.9	11.9	12.4	12.2	8.60

Table 2b
Summary of Deep Phase II, Part II Soil Analytical Results
SWLP MGP
Superior, Wisconsin

Analyte	Units	WDNR Soil Standard [a]	B-8-6-8	B-9-10-12	B-10-6-8	B-11-1-3	B-11-10-12	B-12-8-10	B-13-15-16	B-14-15-16	B-14-11-12	B-15-6-8	B-16-6-8	B-17-6-8	B-18-10-12
Metals															
Cyanide, total	mg/kg	NE [b]	---[c]	---	---	---	---	---	---	---	3	---	---	---	---
PAH															
1-Methylnaphthalene	ug/kg	23,000	---	---	---	73	3,400	2,300	85	<20	---	270Q	25Q	730	<19
2-Methylnaphthalene	ug/kg	20,000	---	---	---	74	3,400	3,200	77	<17	---	420Q	32Q	1,300	<16
Acenaphthene	ug/kg	38,000	---	---	---	<23	3,500	820Q[d]	82	<23	---	<220	23Q	<210	<22
Acenaphthylene	ug/kg	700	---	---	---	25Q	**930**	630Q	<17	<18	---	<160	<17	310Q	<17
Anthracene	ug/kg	3,000,000	---	---	---	<17	2,300	420Q	<16	<17	---	180Q	<17	<160	<16
Benzo(a)anthracene	ug/kg	17,000	---	---	---	52Q	2,700	690Q	<18	<19	---	330Q	<19	410Q	<18
Benzo(a)pyrene	ug/kg	48,000	---	---	---	51Q	2,300	690Q	<17	<18	---	270Q	<17	180Q	<17
Benzo(b)fluoranthene	ug/kg	360,000	---	---	---	30Q	1,200	500Q	<15	<15	---	210Q	<15	280Q	<15
Benzo(g,h,i)perylene	ug/kg	6,800,000	---	---	---	54	1,900	1,000Q	<16	<16	---	300Q	<16	510	<15
Benzo(k)fluoranthene	ug/kg	870,000	---	---	---	43Q	1,800	580Q	<18	<18	---	260Q	<18	280Q	<17
Chrysene	ug/kg	37,000	---	---	---	57Q	3,400	1000Q	<18	<19	---	340Q	<19	480Q	<18
Dibenzo(a,h)anthracene	ug/kg	38,000	---	---	---	<16	460Q	<350	<15	<15	---	<140	<15	<140	<15
Fluoranthene	ug/kg	500,000	---	---	---	30Q	4,200	1,500	<14	<15	---	780	<14	910	<14
Fluorene	ug/kg	100,000	---	---	---	<18	2,100	<400	23Q	<18	---	190Q	<17	230Q	<17
Indeno(1,2,3-cd)pyrene	ug/kg	680,000	---	---	---	36Q	1,200	710Q	<16	<16	---	<150	<16	310Q	<15
Naphthalene	ug/kg	400	---	---	---	**660**	**8,900**	**36,000**	42Q	**410**	---	**4,900**	**410**	**7,900**	<23
Phenanthrene	ug/kg	1,800	---	---	---	32Q	**9,200**	**2,200**	42Q	<15	---	1,200	41Q	**1,800**	<15
Pyrene	ug/kg	8,700,000	---	---	---	98	8,100	2,000	<16	<17	---	1,400	20Q	1,200	<16
VOC															
1,2,4-Trimethylbenzene	ug/kg	NE	---	---	---	130	7,100	38,000	220	71	---	130,000	1,400	1,900	<25
1,3,5-Trimethylbenzene	ug/kg	NE	---	---	---	79	5,200	24,000	<100	<25	---	83,000	700	1,200	<25
Isopropylbenzene	ug/kg	NE	---	---	---	<25	<1000	<5000	<100	<25	---	<2,500	74	<50	<25
Styrene	ug/kg	NE	---	---	---	<25	40,000	140,000	<100	<25	---	240,000	290	1,400	<25
Benzene	ug/kg	5.5	**54,000**	**100**	**120,000**	**2,200**	**240,000**	**590,000**	**27,000**	**12,000**	---	**76,000**	**10,000**	**16,000**	<25
Ethylbenzene	ug/kg	2,900	380	<25	410	120	**7,200**	**45,000**	370	160	---	**100,000**	**3,500**	350	<25
Toluene	ug/kg	1,500	<130	<25	**59,000**	900	**340,000**	**1,700,000**	460	230	---	**790,000**	**5,500**	**16,000**	<25
Xylene, -o	ug/kg	4,100 [e]	<130	<25	**1,700**	160	**35,000**	**150,000**	<100	39Q	---	**310,000**	**2,100**	**3,400**	<25
Xylenes, -m, -p	ug/kg	4,100 [e]	1,100	<25	**6,700**	260	**130,000**	**540,000**	260	140	---	**1,100,000**	**7,600**	**11,000**	<25

a. Residual Contaminant Levels (RCL) for Protection of Groundwater. No RCLs established for metals. RCLs for PAH are from Table 1, Soil Cleanup Levels for PAHs Interim Guidance. RCL for VOCs are from Table 1, WAC NR 720.
b. NE = None established.
c. --- = Not analyzed.
d. Q means the analyte has been detected between the limit of detection and limit of quantification. The results are qualified as approximate concentrations due to the uncertainty of analyte concentrations within this range.
e. The RCL for xylene is 4,100 ug/kg for the sum of all xylenes.

Note: Bold results indicate concentrations greater than applicable RCL.
Approximate sample depth beneath sample ID is reported in feet below grade.
Only deep soil samples (greater than 4-feet deep) are reported in this table.
Samples were collected for the Phase II Part II Investigation (see Phase II, Part II Report dated February 2003).

Table 2b
Summary of Deep Phase II, Part II Soil Analytical Results
SWLP MGP
Superior, Wisconsin

Analyte	Units	WDNR Soil Standard [a]	B-19-10-12	B-20-10-12	B-21-10-12	B-21-10-12-dup	B-22-8-10
Metals							
Cyanide, total	mg/kg	NE [b]	---	---	---	---	---
PAH							
1-Methylnaphthalene	ug/kg	23,000	<18	28Q	<18	<19	<19
2-Methylnaphthalene	ug/kg	20,000	<16	44Q	<15	<16	<17
Acenaphthene	ug/kg	38,000	<21	<20	<21	<22	<23
Acenaphthylene	ug/kg	700	<16	<15	<16	<17	<17
Anthracene	ug/kg	3,000,000	<16	23Q	<15	<16	<17
Benzo(a)anthracene	ug/kg	17,000	<18	<16	<17	<18	<19
Benzo(a)pyrene	ug/kg	48,000	<16	<15	<16	<17	<17
Benzo(b)fluoranthene	ug/kg	360,000	<14	<13	<14	<15	<15
Benzo(g,h,i)perylene	ug/kg	6,800,000	<15	<14	<15	<16	<16
Benzo(k)fluoranthene	ug/kg	870,000	<17	<16	<17	<18	<18
Chrysene	ug/kg	37,000	<18	<16	<17	<18	<19
Dibenzo(a,h)anthracene	ug/kg	38,000	<14	<13	<14	<15	<15
Fluoranthene	ug/kg	500,000	<14	<13	<14	<14	<14
Fluorene	ug/kg	100,000	<16	<15	<16	<17	<17
Indeno(1,2,3-cd)pyrene	ug/kg	680,000	<15	<14	<15	<16	<16
Naphthalene	ug/kg	400	<22	<20	<22	<23	<23
Phenanthrene	ug/kg	1,800	<14	22Q	<14	<15	<15
Pyrene	ug/kg	8,700,000	<16	<14	<15	<16	<17
VOC							
1,2,4-Trimethylbenzene	ug/kg	NE	<25	<25	<25	<25	<25
1,3,5-Trimethylbenzene	ug/kg	NE	<25	<25	<25	<25	<25
Isopropylbenzene	ug/kg	NE	<25	<25	<25	<25	<25
Styrene	ug/kg	NE	<25	<25	<25	<25	<25
Benzene	ug/kg	5.5	**36Q**	**54Q**	<25	<25	<25
Ethylbenzene	ug/kg	2,900	<25	<25	<25	<25	<25
Toluene	ug/kg	1,500	<25	35Q	<25	<25	<25
Xylene, -o	ug/kg	4,100 [e]	<25	<25	<25	<25	<25
Xylenes, -m, -p	ug/kg	4,100 [e]	<25	<25	<25	<25	<25

Table 2c
Summary of Deep Phase II, Part III Soil Analytical Results
SWLP MGP
Superior, Wisconsin

Analyte	Units	WDNR Soil Standards [a]	B-24 5-6 Ft	B-25 7-8 Ft	B- 26 6-7 Ft	B-27 7-8 Ft	B-28 5-6 Ft	B-29 6-7 Ft	B-30 8-9 Ft	B-31 14-15 Ft	MW-8 7-8 Ft	MW-9 8-9 Ft	MW-10 5-6 Ft	MW-11 6-7 Ft	MW-11 6-7 Ft dup	MW-12 4-5 Ft
PAH																
1-Methylnaphthalene	mg/kg	23	0.44	**72**	0.19	1.8	0.14	0.25	2.2	6.1	9	1.4	**220**	0.023	0.005	0.036
2-Methylnaphthalene	mg/kg	20	0.59	**99**	0.11	0.47	0.082	0.31	2.8	11	12	1.6	**250**	0.010	0.005	0.055
Acenaphthene	mg/kg	38	0.071	**94**	0.23	3.1	0.17	0.044	3.5	3.4	13	1.6	**310**	0.091	0.027	0.013
Acenaphthylene	mg/kg	0.7	0.019	**5.2**	<0.0097	0.49	0.072	0.03	0.2	**15**	**9.9**	**0.79**	**25**	0.012	<0.0075	0.028
Anthracene	mg/kg	3,000	0.096	40	0.024	2	0.082	0.13	1.8	9.5	10	1.3	150	0.023	0.009	0.047
Benzo(a)anthracene	mg/kg	17	0.084	**20**	0.022	1.7	0.10	0.24	0.79	**9.6**	13	1.3	**89**	0.055	0.019	0.11
Benzo(a)pyrene	mg/kg	48	0.058	15	0.027	1.4	0.15	0.17	0.58	13	30	1.1	**67**	0.058	0.019	0.12
Benzo(b)fluoranthene	mg/kg	360	0.048	6.5	<0.014	0.76	0.089	0.18	0.23	8.9	15	0.66	32	0.028	<0.011	0.088
Benzo(ghi)perylene	mg/kg	6,800	0.025	7.5	0.015	0.85	0.10	0.07	0.24	14	13	0.72	19	0.031	0.010	0.069
Benzo(k)fluoranthene	mg/kg	870	0.044	8.9	<0.019	0.86	0.097	0.17	0.36	8.9	15	0.78	41	0.035	<0.015	0.094
Chrysene	mg/kg	37	0.096	19	0.024	1.7	0.11	0.25	0.76	13	17	1.4	**82**	0.046	0.018	0.120
Dibenz(a,h)anthracene	mg/kg	38	<0.0084	1.7	<0.0058	0.2	0.017	0.24	0.061	2	3.3	0.15	5	0.007	<0.0044	0.015
Fluoranthene	mg/kg	500	0.015	46	0.43	3.5	0.19	0.5	1.9	17	18	2.7	190	0.099	0.039	0.210
Fluorene	mg/kg	100	0.056	33	0.054	1.1	0.073	0.054	1.2	2.3	4	0.83	**130**	0.024	0.004	0.012
Indeno(1,2,3-cd)pyrene	mg/kg	680	0.019	5.2	0.012	0.6	0.077	0.072	0.18	9.1	10	0.5	15	0.023	0.008	0.059
Naphthalene	mg/kg	0.4	**0.50**	**200**	**0.430**	**0.71**	0.12	0.23	**4.5**	**190**	**22**	**5.1**	**160**	0.038	0.013	0.056
Phenanthrene	mg/kg	1.8	0.52	**130**	0.10	**6.70**	0.33	0.51	**5.2**	**15**	**22**	**4.3**	**520**	0.015	0.008	0.160
Pyrene	mg/kg	8,700	0.19	63	0.053	4.3	0.18	0.37	2.4	19	28	3.8	260	0.140	0.051	0.170
VOC																
Benzene	mg/kg	0.0055	**0.130**	**2.2**	**3.3**	**25**	**0.690**	**5.7**	**14**	**13,000**	**5.9**	**34**	**17**	**0.044**	<0.033	**1.2**
Ethylbenzene	mg/kg	2.9	0.048	**42**	<0.025	**5.6**	0.063	0.3	**16**	**170**	0.73	**31**	**3.2**	<0.043	<0.033	<0.028
Toluene	mg/kg	1.5	0.27	1.3	<0.025	**9**	0.100	**6.5**	<0.2	**11,000**	**3.2**	1.0	0.16	0.53	0.12	0.42
Xylene, -o	mg/kg	4.1 [b]	0.11	**16**	<0.025	**4.7**	0.064	0.78	**5.9**	**2,100**	0.62	**24**	1.3	<0.043	<0.033	0.038
Xylenes, -m, -p	mg/kg	4.1 [b]	0.19	**29**	<0.050	**6.5**	0.090	2.2	**1.5**	**2,900**	1.1	**85**	0.62	0.068	<0.033	0.07

a. Residual Contaminant Levels (RCL) for Protection of Groundwater. No RCLs established for metals.
RCLs for PAH are from Table 1, Soil Cleanup Levels for PAHs Interim Guidance. RCL for BTEX are from Table 1, WAC NR 720.
b. The RCL for xylene is 4,100 ug/kg for the sum of all xylenes.

Note: Bold results indicate concentrations greater than applicable RCL.
Approximate sample depth beneath sample ID is reported in feet below grade.
Only deep soil samples (greater than 4-feet deep) are reported in this table.
Samples were collected for the Phase II, Part III Investigation (see Phase II, Part III Report dated March 2005).

Table 2d
Summary of Deep Phase II, Part IV Soil Analytical Results
SWLP MGP
Superior, Wisconsin

Sample ID *Sample Depth* *Date*	**Units**	**WDNR Soil Standards [a]**	**MW-14** **6-7'** **10/10/2005**	**MW-15** **4-5'** **10/11/2005**	**MW-16** **6-7'** **10/12/2005**	**MW-16 Dup** **6-7'** **10/12/2005**	**MW-21** **4-5'** **10/12/2005**	**MW-22** **4-5'** **10/13/2005**	**LIF-55** **5-6'** **5/25/2006**	**LIF-48** **4-5'** **5/25/2006**
VOC										
Benzene	ug/kg	**5.5**	<53	**120**	<61	<50	<48	**2,200**	---	---
Ethylbenzene	ug/kg	**2,900**	<53	<46	<61	<50	<48	<62	---	---
Naphthalene	ug/kg	**400**	<53	110	<61	<50	<48	<62	---	---
p-Isopropyltoluene	ug/kg	**NE**	<53	<46	<61	<50	<48	190	---	---
Toluene	ug/kg	**1,500**	<53	75	71	<50	<48	820	---	---
Xylene, o	ug/kg	**4,100** [b]	<53	<46	<61	<50	<48	<62	---	---
Xylenes, m + p	ug/kg	**4,100** [b]	<110	<93	<120	<100	<96	<120	---	---
PAH										
1-Methylnaphthalene	ug/kg	**23,000**	<3.9	48	16	15	14	14	24	17
2-Methylnaphthalene	ug/kg	**20,000**	<4.0	81	22	23	19	22	19	16
Acenaphthene	ug/kg	**38,000**	<3.8	31	4.9	<3.3	8.5	<4.5	51	<6.5
Acenaphthylene	ug/kg	**700**	<3.7	350	3.8	3.7	<3.1	<4.3	100	<6.3
Anthracene	ug/kg	**3,000,000**	<4.6	140	14	11	25	<5.4	130	<7.8
Benzo(a)anthracene	ug/kg	**17,000**	<6.9	270	37	28	53	15	340	<12
Benzo(a)pyrene	ug/kg	**48,000**	<3.7	590	37	26	45	8.5	440	11
Benzo(b)fluoranthene	ug/kg	**360,000**	<3.6	340	28	21	35	6	240	8.3
Benzo(ghi)perylene	ug/kg	**6,800,000**	<4.6	310	18	20	20	<5.4	240	7.8
Benzo(k)fluoranthene	ug/kg	**870,000**	<4.0	340	34	23	42	<4.6	350	7.3
Chrysene	ug/kg	**37,000**	<5.6	280	36	29	50	21	450	<9.6
Dibenz(a,h)anthracene	ug/kg	**38,000**	<3.6	77	6.1	6.3	7.2	<4.2	55	<6.0
Fluoranthene	ug/kg	**500,000**	4.8	31	60	44	100	8.8	400	<6.3
Fluorene	ug/kg	**100,000**	<4.4	21	6.3	4.1	8.3	<5.2	46	<7.5
Indeno(1,2,3-cd)pyrene	ug/kg	**680,000**	<3.3	240	18	17	21	<3.8	140	6
Naphthalene	ug/kg	**400**	<5.2	110	19	17	15	16	<21	<8.8
Phenanthrene	ug/kg	**1,800**	<3.8	230	61	43	88	15	200	<6.5
Pyrene	ug/kg	**8,700,000**	4.2	330	60	45	86	36	700	7.5

a. Residual Contaminant Levels (RCL) for Protection of Groundwater. No RCLs established for metals. RCLs for PAH are from Table 1, Soil Cleanup Levels for PAHs Interim Guidance. RCL for BTEX are from Table 1, WAC NR 720.

b. The RCL for xylene is 4,100 ug/kg for the sum of all xylenes.

Note: Bold results indicate concentrations greater than applicable RCL.

Approximate sample depth beneath sample ID is reported in feet below grade.

Only deep soil samples (greater than 4-feet deep) are reported in this table.

Samples were collected for the Phase II, Part IV Investigation (see Phase II, Part IV Report dated May 2007).

Table 3
Summary of Groundwater Analytical Results
Superior Water, Light Power MGP
Superior, Wisconsin

Well ID / *Date*	Enforcement Standard [a]	MW-1 11/15/2005	MW-2 11/15/2005	MW-3 11/15/2005	MW-4 11/15/2005	MW-5 11/15/2005	MW-6 11/16/2005	MW-7 11/16/2005	MW-8 11/15/2005	MW-9 11/15/2005	MW-10 11/15/2005	MW-11 11/15/2005	MW-11 FD 11/15/2005	MW-12 11/14/2005	MW-13 11/15/2005	MW-13 10/24/2006	MW-14 11/16/2005	MW-14 10/24/2006	MW-15 11/14/2005	MW-15 FD 11/14/2005
VOC																				
Acetone	**1,000**	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<5.0	---	<5.0	---	---
Benzene	**5**	<0.41	<0.41	**2,800**	**190,000**	<0.41	4.6	**110,000**	**73,000**	**29,000**	**13,000**	1.4	1.4	**4,100**	3.8	<1.0	<0.41	<1.0	**23**	**21**
2-Butanone (MEK)	**460**	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<5.0	---	<5.0	---	---
Bromobenzene	**NE** [b]	<0.82	<0.82	<20	<1,000	<0.82	<0.82	<820	<510	<200	<100	<0.82	<0.82	<20	<0.82	<1.0	<0.82	<1.0	<0.82	<0.82
Chloroethane	**400**	<0.97	<0.97	<24	<1,200	<0.97	0.97	<970	<610	<240	<120	<0.97	<0.97	<24	<0.97	<1.0	<0.97	<1.0	<0.97	<0.97
Chloroform	**6**	<0.37	<0.37	<9.2	<460	<0.37	<0.37	<370	<230	<92	<46	<0.37	<0.37	<9.2	<0.37	<1.0	<0.37	<1.0	<0.37	<0.37
Chloromethane	**3**	0.33	<0.24	<6.0	<300	<0.24	<0.48	<240	<150	<60	<30	0.25	<0.24	<6.0	0.6	<1.0	0.56	<1.0	<0.24	<0.24
Ethylbenzene	**700**	<0.54	<0.54	130	<680	<0.54	3.3	**3,600**	510	530	240	0.91	1	<14	<0.54	<1.0	<0.54	<1.0	6.8	5
Isopropylbenzene (Cumene)	**NE**	<0.59	<0.59	<15	<740	<0.59	<0.59	<590	<370	<150	<74	<0.59	<0.59	<15	<0.59	<1.0	<0.59	<1.0	4.3	4
p-Isopropyltoluene	**NE**	<0.67	<0.67	<17	<840	<0.67	<0.67	<670	<420	<170	<84	<0.67	<0.67	<17	<0.67	<1.0	<0.67	<1.0	<0.67	<0.67
Naphthalene	**100**	<0.74	<0.74	**2,100**	<920	1.2	26	<740	**680**	**340**	**240**	29	33	<18	<0.74	<1.0	0.93	<1.0	**110**	90
n-Propylbenzene	**NE**	<0.81	<0.81	<20	<1,000	<0.81	<0.81	<810	<510	<200	<100	<0.81	<0.81	<20	<0.81	<1.0	<0.81	<1.0	1.6	1.4
Styrene	**100**	<0.86	<0.86	<22	<1,100	<0.86	<0.86	<860	**2,000**	<220	<110	<0.86	<0.86	<22	<0.86	<1.0	<0.86	<1.0	<0.86	<0.86
Toluene	**1,000**	<0.67	<0.67	25	**1,500**	<0.67	1.1	**57,000**	**51,000**	**6,700**	**5,100**	<0.67	<0.67	<17	<0.67	<1.0	<0.67	<1.0	<0.67	<0.67
1,2,4-Trimethylbenzene	**480** [c]	<0.97	<0.97	120	<1,200	<0.97	<0.97	<970	<610	<240	<120	<2.9	<3.0	<24	<0.97	<1.0	<0.97	<1.0	25	23
1,3,5-Trimethylbenzene	**480**	<0.83	<0.83	41	<1,000	<0.83	<0.83	<830	<520	<210	<100	<0.83	<0.83	<21	<0.83	<1.0	<0.83	<1.0	3.6	2.9
m&p-Xylene	**10,000** [d]	<1.8	<1.8	260	<2,200	<1.8	<1.8	**12,000**	**9,900**	2,200	770	<1.8	<1.8	<45	<1.8	<2.0	<1.8	<2.0	<1.8	<1.8
o-Xylene	**10,000** [d]	<0.83	<0.83	25	<1,000	<0.83	1.2	**2,500**	**2,200**	**420**	**180**	1.4	1.5	<21	<0.83	<1.0	<0.83	<1.0	2.8	2.2
PAH																				
Acenaphthene	**NE**	0.049	<0.0088	2.7	<0.086	0.38	5.1	3.1	37	39	38	8.7	9.6	46	<0.0086	<0.04	<0.0086	<0.04	43	51
Acenaphthylene	**NE**	<0.0086	<0.0088	1.4	<0.086	0.011	<0.43	1.3	4.7	1.6	2.9	0.1	0.11	<0.86	<0.0086	<0.04	<0.0086	<0.04	<1.7	0.71
Anthracene	**3,000**	<0.012	<0.013	1.7	<0.12	0.034	<0.61	<1.3	7.9	8.4	8.6	0.12	0.13	4.0	<0.012	<0.04	<0.012	<0.04	3.5	4.2
Benzo(a)anthracene	**NE**	<0.017	<0.017	<1.7	<0.17	<0.017	<0.83	<1.7	<1.7	<1.7	3.9	0.017	0.018	<1.7	<0.017	<0.04	<0.017	<0.04	0.27	<0.33
Benzo(a)pyrene	**0.2**	<0.019	<0.020	<1.9	<0.19	<0.019	<0.97	<2.0	<1.9	<1.9	**2.7**	0.019	<0.019	<1.9	<0.019	<0.04	<0.019	<0.04	0.11	<0.39
Benzo(b)fluoranthene	**0.2**	<0.017	<0.017	<1.7	<0.17	<0.017	<0.83	<1.7	<1.7	<1.7	<1.7	<0.017	<0.017	<1.7	<0.017	<0.04	<0.017	<0.04	0.054	<0.33
Benzo(g,h,i)perylene	**NE**	<0.020	<0.021	<2.0	<0.20	<0.020	<1.0	<2.1	<2.0	<2.0	<2.0	<0.020	<0.020	<2.0	<0.020	<0.04	<0.020	<0.04	0.054	<0.41
Benzo(k)fluoranthene	**NE**	<0.020	<0.021	<2.0	<0.20	<0.020	<1.0	<2.1	<2.0	<2.0	<2.0	<0.020	<0.020	<2.0	<0.020	<0.04	<0.020	<0.04	0.063	<0.41
2-Chloronaphthalene	**NE**	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<0.04	---	<0.04	---	---
Chrysene	**0.2**	<0.020	<0.021	<2.0	<0.20	<0.020	<1.0	<2.1	<2.0	<2.0	**4.5**	<0.020	<0.020	<2.0	<0.020	<0.04	<0.020	<0.04	**0.22**	<0.40
Dibenzofuran	**NE**	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<0.04	---	<0.04	---	---
Fluoranthene	**400**	<0.016	<0.017	<1.6	<0.16	0.041	<0.82	<1.7	6.6	4.8	11	<0.059	0.059	<1.6	<0.016	<0.04	<0.016	0.057	<3.3	2.2
Fluorene	**400**	0.0097	<0.0098	6	<0.096	0.2	0.5	1.7	11	12	11	0.73	0.79	8.7	0.014	<0.04	<0.0096	<0.04	7.3	10
Indeno(1,2,3-cd)pyrene	**NE**	<0.020	<0.020	<2.0	<0.20	<0.020	<1.0	<2.1	<2.0	<2.0	<2.0	<0.020	<0.020	2.0	<0.020	<0.04	<0.020	<0.04	0.037	<0.40
1-Methylnaphthalene	**NE**	0.07	<0.012	82	0.11	0.14	4.1	6.2	61	42	41	9.4	9.9	43	0.055	<0.04	<0.011	<0.04	45	57
2-Methylnaphthalene	**NE**	0.05	<0.012	29	0.13	0.057	2.4	8.4	44	44	18	1.2	1.2	1.8	0.045	<0.04	<0.012	<0.04	17	20
Naphthalene	**100**	0.28	0.038	**650**	2.9	0.77	18	**330**	**380**	**160**	**110**	17	18	<4.9	0.34	<0.04	0.023	<0.04	83	93
Phenanthrene	**NE**	<0.012	<0.012	9.6	<0.12	0.067	3.1	3.2	35	33	30	0.39	0.46	<15	0.022	<0.04	<0.012	0.073	16	22
Pyrene	**250**	<0.015	<0.016	<1.5	<0.15	0.033	0.81	<1.6	8.6	6.3	15	0.085	0.089	<1.8	<0.015	<0.04	<0.015	0.068	<3.1	2.6

Notes:
Results are reported in micrograms per liter or parts per billion.
Shaded results indicate concentrations greater than the enforcement standards.

a. The Wisconsin Department of Natural Resources Groundwater Enforcement Standards for the protection of public health (NR 140, Table 1).
b. NE means enforcement standard is not established.
c. The enforcement standard is 480 ug/L for the sum of all trimethylbenzene concentrations.
d. The enforcement standard is 10,000 ug/L for the total xylene concentrations.

Table 3
Summary of Groundwater Analytical Results
Superior Water, Light Power MGP
Superior, Wisconsin

Well ID / *Date*	Enforcement Standard [a]	MW-15 10/24/2006	MW-16 11/15/2005	MW-16 10/24/2006	MW-17 11/15/2005	MW-17 10/24/2006	MW-18 11/15/2005	MW-18 10/24/2006	MW-19 11/14/2005	MW-19 10/24/2006	MW-20 11/14/2005	MW-20 10/24/2006	MW-21 11/15/2005	MW-21 10/24/2006	MW-22 11/15/2005	MW-22 10/24/2006
VOC																
Acetone	**1,000**	<5.0	---	<5.0	---	<5.0	---	110	---	<5.0	---	<5.0	---	<5.0	---	171
Benzene	**5**	**23.2**	<0.41	<1.0	<0.41	<1.0	4.1	4.1	<0.41	<1.0	**3,800**	<1.0	<0.41	<1.0	**10**	**6.4**
2-Butanone (MEK)	**460**	<5.0	---	<5.0	---	<5.0	---	<5.0	---	<5.0	---	<5.0	---	<5.0	---	10.5
Bromobenzene	**NE** [b]	<1.0	<0.82	<1.0	<0.82	<1.0	<0.82	<1.0	<0.82	<1.0	<41	5,380	<0.82	<1.0	<0.82	<1.0
Chloroethane	**400**	<1.0	<0.97	<1.0	<0.97	<1.0	<0.97	<1.0	<0.97	<1.0	<48	<1.0	<0.97	<1.0	<0.97	<1.0
Chloroform	**6**	<1.0	<0.37	<1.0	<0.37	<1.0	<0.37	<1.0	<0.37	<1.0	<18	<1.0	0.39	<1.0	<0.37	1.1
Chloromethane	**3**	<1.0	0.53	<1.0	<0.24	<1.0	0.33	<1.0	<0.24	<1.0	<12	<1.0	<0.24	<1.0	0.48	<1.0
Ethylbenzene	**700**	5	<0.54	<1.0	<0.54	<1.0	<0.54	<1.0	<0.54	<1.0	43	10.1	<0.54	<1.0	<0.54	<1.0
Isopropylbenzene (Cumene)	**NE**	4.4	<0.59	<1.0	<0.59	<1.0	<0.59	<1.0	<0.59	<1.0	<30	6.7	<0.59	<1.0	<0.59	<1.0
p-Isopropyltoluene	**NE**	<1.0	<0.67	<1.0	<0.67	<1.0	<0.67	<1.0	<0.67	<1.0	<34	<1.0	<0.67	<1.0	<0.67	2.3
Naphthalene	**100**	79.7	<0.74	<1.0	<0.74	<1.0	0.89	<1.0	<0.74	<1.0	**280**	41.1	<0.74	<1.0	2.7	2.9
n-Propylbenzene	**NE**	1.5	<0.81	<1.0	<0.81	<1.0	<0.81	<1.0	<0.81	<1.0	<40	3.1	<0.81	<1.0	<0.81	<1.0
Styrene	**100**	<1.0	<0.86	<1.0	<0.86	<1.0	<0.86	<1.0	<0.86	<1.0	<43	<1.0	<0.86	<1.0	<0.86	<1.0
Toluene	**1,000**	<1.0	<0.67	<1.0	<0.67	<1.0	3.2	1.1	<0.67	<1.0	<34	<1.0	<0.67	<1.0	1.5	1.8
1,2,4-Trimethylbenzene	**480**[c]	17.7	<0.97	<1.0	<0.97	<1.0	<0.97	<1.0	<0.97	<1.0	<48	31	<0.97	<1.0	<0.97	<1.0
1,3,5-Trimethylbenzene	**480**	1.7	<0.83	<1.0	<0.83	<1.0	<0.83	<1.0	<0.83	<1.0	<42	1.3	<0.83	<1.0	<0.83	<1.0
m&p-Xylene	**10,000**[d]	<2.0	<1.8	<2.0	<1.8	<2.0	<1.8	<2.0	<1.8	<2.0	<90	<1.0	<1.8	<2.0	<1.8	<2.0
o-Xylene	**10,000**[d]	2.4	<0.83	<1.0	<0.83	<1.0	<0.83	<1.0	<0.83	<1.0	<42	12.6	<0.83	<1.0	<0.83	<1.0
PAH																
Acenaphthene	**NE**	49.6	0.042	<0.04	0.017	0.056	0.09	0.1	0.045	<0.04	14	27.1	0.016	<0.04	1.9	0.14
Acenaphthylene	**NE**	<0.04	<0.0086	<0.04	<0.0086	<0.04	0.013	<0.04	<0.0086	<0.04	<0.86	<0.04	<0.0086	<0.04	0.12	<0.04
Anthracene	**3,000**	2.8	0.023	<0.04	0.015	<0.04	0.049	0.072	0.015	<0.04	<1.2	0.2	<0.012	<0.04	0.98	0.05
Benzo(a)anthracene	**NE**	0.23	0.027	0.049	<0.017	<0.04	0.044	0.047	<0.017	<0.04	<1.7	<0.04	<0.017	<0.04	0.4	0.052
Benzo(a)pyrene	**0.2**	<0.04	0.021	<0.04	<0.019	<0.04	0.026	<0.04	<0.019	<0.04	<1.9	<0.04	<0.019	<0.04	**0.21**	<0.04
Benzo(b)fluoranthene	**0.2**	0.16	<0.017	0.17	<0.017	<0.04	0.019	0.15	<0.017	<0.04	<1.7	<0.04	<0.017	<0.04	<0.17	0.16
Benzo(g,h,i)perylene	**NE**	<0.04	<0.020	0.26	<0.020	<0.04	<0.020	<0.04	<0.020	<0.04	<2.0	<0.04	<0.020	<0.04	<0.20	0.26
Benzo(k)fluoranthene	**NE**	<0.04	<0.020	<0.04	<0.020	<0.04	<0.020	<0.04	<0.020	<0.04	<2.0	<0.04	<0.020	<0.04	<0.20	<0.04
2-Chloronaphthalene	**NE**	0.075	---	<0.04	---	<0.04	---	<0.04	---	<0.04	---	<0.04	---	<0.04	---	<0.04
Chrysene	**0.2**	0.19	0.024	0.044	<0.020	<0.04	0.044	<0.04	<0.020	<0.04	<2.0	<0.04	<0.020	<0.04	**0.38**	0.057
Dibenzofuran	**NE**	0.61	---	<0.04	---	<0.04	---	0.042	---	<0.04	---	0.19	---	<0.04	---	<0.04
Fluoranthene	**400**	1.9	0.035	0.097	0.023	<0.04	0.09	0.18	0.021	<0.04	<1.6	0.34	<0.016	<0.04	1.1	0.083
Fluorene	**400**	10.2	0.015	<0.04	<0.0096	<0.04	0.059	0.064	0.012	<0.04	<0.96	3.3	<0.0096	<0.04	0.71	<0.04
Indeno(1,2,3-cd)pyrene	**NE**	<0.04	<0.020	<0.04	<0.020	<0.04	<0.020	<0.04	<0.020	<0.04	<2.0	<0.04	<0.020	<0.04	<0.20	<0.04
1-Methylnaphthalene	**NE**	38.4	0.074	<0.04	<0.011	<0.04	0.17	0.22	0.04	<0.04	18	29.5	0.02	<0.04	1.7	0.25
2-Methylnaphthalene	**NE**	9.4	0.047	<0.04	<0.012	<0.04	0.13	0.18	0.025	<0.04	1.4	1.5	0.023	<0.04	1.2	0.17
Naphthalene	**100**	49.8	0.36	<0.04	0.029	<0.04	0.13	0.21	0.097	<0.04	130	21.4	0.23	<0.04	3.4	0.52
Phenanthrene	**NE**	14.9	0.054	0.075	0.052	0.07	0.21	0.43	0.036	<0.04	<1.2	1.2	<0.012	<0.04	3.1	0.21
Pyrene	**250**	2.5	0.059	0.079	0.037	<0.04	0.16	0.21	0.026	<0.04	<1.5	0.29	<0.015	<0.04	1.5	0.1

Notes:
Results are reported in micrograms per liter or p
Shaded results indicate concentrations greater t

a. The Wisconsin Department of Natural Resou
for the protection of public health (NR 140, Ta
b. NE means enforcement standard is not estab
c. The enforcement standard is 480 ug/L for the
d. The enforcement standard is 10,000 ug/L for

Table 4
Groundwater Elevation Data and Well Summary
Superior Water Light Power MGP
Superior, Wisconsin

Well ID	Ground Elevation [a]	Measuring Point Elevation [b]	Depth to Water [c]	Groundwater Elevation[b]	Hydraulic Conductivity [d]
MW-1	616.2	619.11	9.67	609.44	Clay[e]
MW-2	614.2	617.15	6.11	611.04	Clay
MW-3	613.9	617.07	6.45	610.62	Clay
MW-4	614.0	617.11	7.31	609.80	Clay
MW-5	610.1	612.40	8.49	603.91	7.63×10^{-5}
MW-6	611.4	613.74	10.02	603.72	3.07×10^{-3}
MW-7	612.3	614.91	11.7	603.21	7.79×10^{-3}
MW-8	612.0	615.17	12.06	603.11	3.26×10^{-3}
MW-9	608.7	611.38	8.53	602.85	1.17×10^{-2}
MW-10	606.5	606.08	3.55	602.53	7.46×10^{-3}
MW-11	607.0	609.89	8.27	601.62	8.48×10^{-3}
MW-12	607.9	607.64	5.86	601.78	3.28×10^{-3}
MW-13	613.56	616.26	7.45	608.81	Clay
MW-14	614.06	617.27	8.70	608.57	Clay
MW-15	609.06	608.95	7.12	601.83	1.1×10^{-3}
MW-16	610.03	613.11	10.20	602.91	1.6×10^{-3}
MW-17	608.48	610.93	8.33	602.60	2.3×10^{-3}
MW-18	606.4	606.42	2.67	603.75	4.5×10^{-5}
MW-19	606.82	606.77	3.91	602.86	1.0×10^{-2}
MW-20	605.91	605.43	4.22	601.21	6.8×10^{-3}
MW-21	609.59	612.57	9.82	602.75	1.5×10^{-1}
MW-22	607.5	610.55	7.5	603.05	4.4×10^{-3}

Groundwater elevations were measured on 10/24/06 with an interface probe.

a. The ground surface and top of casings elevations were surveyed by Salo Engineering.
b. Elevation is given in feet above mean sea level.
c. Depth to water in feet as measured below top of casing.
d. Hydraulic conductivity (cm/sec) was determined by conducting slug tests in November 2001, November 2004, and October 2006.
e. Wells screened in high plasticity clay. Estimated hydraulic conductivity is less than 10^{-6} cm/sec. (Slug test was not performed on well.)

Appendix A
Well and Geologic Records

6 WGNHS ORIGINAL Douglas

Wisconsin Geological and Natural History Survey.

probably ~~SE~~ NE NW 14, 49-14W

E. A. BIRGE, Director and Superintendent.

E. R. BUCKLEY, Geologist, in charge of Economic Geology.

STATISTICAL DATA OF WELL BORINGS.

Location of well, as accurately as possible... At Am. Steel Barge works W. Superior on lake front

Quarter,.................Section,.....................Town,.....................Range,.....................

Is the well situated on a hill? If so give approximate elevation... on a fill in lake or

Kind of well. Check below... part of St Louis Bay

Flowing: yes

Deep..... 315

Shallow.....

Not flowing:

Deep.....

Shallow.....

Total depth of well from surface..... feet. .....

Depth of well from surface to where rock is first reached..... feet. .....

Character of material passed through above rock..... 20 ft clay

90 " Black ~~Sand~~ Mucky Drift

45 " Hard Pan

70 " Sand

But most all Hard pan last 50 ft. There was several streaks where water would rise to surface

Total thickness of rock passed through..... feet. .....

Kinds of rock and thickness of each, beginning at the top:

1st kind..... depth in feet. .....

2d kind..... depth in feet. .....

3d kind..... depth in feet. .....

4th kind..... depth in feet. .....

2234

SEE OTHER SIDE

This well flows 14 ft over
lake surface level

Amount of flow of well at 6 ft above lake level 2 gallons per minute

Depth of water in well 31 ft

Have you a chemical analysis of the water? Had

What was the method employed in drilling the well? C Drill

What was the price of drilling?

Above the rock ..... per foot.

In the rock ..... per foot.

Give location of important springs in or near your city None

Check below the source of the water supply of the city or town in which you live

Waterworks: No

River or creek

Lake Superior

Spring

Well

No waterworks

Return to E. R. BUCKLEY, Madison, Wis.

Signed J A Culver

Dated

2234-2

WISCONSIN UNIQUE WELL NUMBER **RH361**

Source: WELL CONSTRUCTION

State of Wi-Private Water Systems-DG/2
Department Of Natural Resources, Box 7921
Madison, WI 53707

Form 3300-77A
(Rev 02/02)bw

Property Owner: FIELD LOGIC | Telephone Number: - -

Mailing Address: 101 MAIN ST

City: SUPERIOR | State: WI | Zip Code: 54880

County of Well Location: 16 DOUGLAS | Co Well Permit No: W | Well Completion Date: April 9, 2001

Well Constructor: KEITH R LIND | License #: 4684

Address: 10945 E HWY 2

City: MAPLE | State: WI | Zip Code: 54854

Hicap Permanent Well # | Common Well #

Facility ID (Public)

Public Well Plan Approval#

Date Of Approval

Specific Capacity: 1.8 gpm/ft

Depth 56 FT

1. Well Location

T=Town C=City V=Village: C of SUPERIOR | Fire#

Street Address or Road Name and Number: 101 MAIN ST

Subdivision Name | Lot# | Block #

Gov't Lot 11 or 1/4 of 1/4 of Section 11 T 49 N;R 14 W

Latitude Deg. Min.

Longitude Deg Min.

2. Well Type 1 (See item 12 below) | Lat/Long Method

1=New 2=Replacement 3=Reconstruction

of previous unique well # _____ constructed in _____

Reason for replaced or reconstructed Well?

3. Well Serves: N # of homes and or **INDUSTRY NON POTABLE** (eg: barn, restaurant, church, school, industry, etc.)

M=Munic O=OTM N=NonCom P=Private Z=Other X=NonPot A=Anode L=Loop H=Drillhole

High Capacity: Well? N Property? N

1 1=Drilled 2=Driven Point 3=Jetted 4=Other

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties? Y

Well located in floodplain? N

Distance in feet from well to nearest: (including proposed)

1. Landfill
2. Building Overhang
3. 1=Septic 2= Holding Tank
4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
60 8. 1=Shoreline 2= Swimming Pool
9. Downspout/ Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain 1=Cast Iron or Plastic 2=Other
100 14. Building Sewer 1 1=Gravity 2=Pressure 2 1=Cast Iron or Plastic 2=Other
15. Collector Sewer: ___ units ___ in . diam.
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo
21. Barn Gutter
22. Manure Pipe 1=Gravity 2=Pressure 1=Cast iron or Plastic 2=Other
23. Other manure Storage
24. Ditch
25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method

Dia.(in.)	From (ft)	To (ft)
8.8	surface	56

Upper Enlarged Drillhole

Lower Open Bedrock

X – 1. Rotary - Mud Circulation

-- 2. Rotary - Air

-- 3. Rotary - Air and Foam

-- 4. Drill-Through Casing Hammer

-- 5. Reverse Rotary

-- 6. Cable-tool Bit _ n. dia

-- 7. Temp. Outer Casing _ in. dia. _____ depth ft. Removed ?

Other

Geology Codes	8. Geology Type, Caving/Noncaving, Color, Hardness, etc	From (ft.)	To (ft.)
GW	FILL WOOD ETC	0	8
NS	FINE SAND	8	35
MS	MEDIUM SAND	35	56

6. Casing Liner Screen Material, Weight, Specification Manufacturer & Method of Assembly

Dia. (in.)		From (ft.)	To (ft.)
6.0	PLAINEND IPSCO ASTM A53B .280 18.97	surface	36

Dia.(in.)	Screen type, material & slot size	From	To
4.0	10 SLOT SS	36	56

7. Grout or Other Sealing Material

Method PUMPING

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
BENTONITE & CUTTINGS	surface	36.0	
CAVING FORMATION	36.0	56.0	

9. Static Water Level

5.0 feet B ground surface (A=Above B=Below)

10. Pump Test

Pumping level 25.0 ft. below surface

Pumping at 35.0 GP 8.0 Hrs

11. Well Is: 24 in. A Grade (A=Above B=Below)

Developed? Y

Disinfected? Y

Capped? Y

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property?

If no, explain NA

13. Initials of Well Constructor or Supervisory Driller KL | Date Signed 2/18/03

Initials of Drill Rig Operator (Mandatory unless same as above) | Date Signed

Additonal Comments? | Variance Issued?

Owner Sent Label? Y | More Geology?

Batch 837

STATE OF WISCONSIN

WELL CONSTRUCTOR'S REPORT — **DEPARTMENT OF RESOURCE DEVELOPMENT** — Wel 6

1. COUNTY: Douglas — CHECK ONE: ☒ Town ☐ Village ☐ City — NAME: Superior

2. LOCATION (Number and Street or ¼ section, section, township and range. Also give subdivision name, lot and block numbers when available.)
T 49 N R ~~14~~ (R14W?) Sec 14 N.E. corner of N.E. Part

3. OWNER AT TIME OF DRILLING: Donald Soderberg

4. OWNER'S COMPLETE MAIL ADDRESS: 1318 91st ave w. Duluth Minn.

5. Distance in feet from well to nearest: (Record answer in appropriate block)

BUILDING	SANITARY SEWER C. I.	SANITARY SEWER TILE	FLOOR DRAIN C. I.	FLOOR DRAIN TILE	FOUNDATION DRAIN SEWER CONNECTED	FOUNDATION DRAIN INDEPENDENT	WASTE WATER DRAIN C. I.	WASTE WATER DRAIN TILE
30'	50'		45'			—	45'	

CLEAR WATER DRAIN C. I.	CLEAR WATER DRAIN TILE	SEPTIC TANK	PRIVY	SEEPAGE PIT	ABSORPTION FIELD	BARN	SILO	ABANDONED WELL	SINK HOLE
45'		100'			125'	—	—	—	—

OTHER POLLUTION SOURCES (Give description such as dump, quarry, drainage well, stream, pond, lake, etc.)
Lake 250'

6. Well is intended to supply water for: Home

7. DRILLHOLE

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
~~10~~ 8'	Surface	40	4"	150	305
6'	40	150'			

8. CASING, LINER, CURBING, AND SCREEN

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
6"	New 19.45 P.E Std 6" ~~20 lb/ft~~ 19.45 P.E	Surface	150
4	Std 4" ~~11 lb to ft~~ 10.89 P.E	150	305

9. GROUT OR OTHER SEALING MATERIAL

Kind	From (ft.)	To (ft.)
Puddled Clay	Surface	40'

10. FORMATIONS

Kind	From (ft.)	To (ft.)
Red Clay	Surface	20
sand & Gravel (dry)	20	40
Clay & silt	40	150
Red Clay	150	290
Hard Pan	290	300
Gravel	300	305

11. MISCELLANEOUS DATA

Yield test: 8 Hrs. at 10 GPM

Depth from surface to normal water level: 50 ft.

Depth to water level when pumping: 60 ft.

Well construction completed on: Sept 3 1968

Well is terminated 8 inches ☐ above ☒ below final grade

Well disinfected upon completion ☒ Yes ☐ No

Well sealed watertight upon completion ☒ Yes ☐ No

Water sample sent to Madison laboratory on: 11/12 1968

Your opinion concerning other pollution hazards, information concerning difficulties encountered, and data relating to nearby wells, screens, seals, type of casing joints, method of finishing the well, amount of cement used in grouting, blasting, subsurface pumprooms, access pits, etc., should be given on reverse side.

SIGNATURE: M. H. Long — Registered Well Driller

COMPLETE MAIL ADDRESS: Poplar Wis.

Please do not write in space below

COLIFORM TEST RESULT	GAS — 24 HRS.	GAS — 48 HRS.	CONFIRMED	REMARKS
See letter driller's file	4/11/68			

2235

SW, SW, NE, sec. 14, T49N, R14W

DS-4-U

WELL CONSTRUCTOR'S REPORT TO WISCONSIN STATE BOARD OF HEALTH

See Instructions on Reverse Side

DS-4-U

Sec 14/15 T49 R14W

1. County Douglas Town ☐ Village ☐ City ☒ Superior — Check one and give name

2. Location 714 N 8th St Superior Wis

Name of street and number of premise or section, Town and Range number

RECEIVED JAN 7 1955 SANITATION

3. Owner ☐ or Agent ☐ Nelson Nelson

Name of individual, partnership or firm

4. Mail Address Superior Wis

Complete address required

5. From well to nearest: Building 8 ft; sewer ____ ft; drain 40 ft; septic tank ✓ ft; dry well or filter bed ✓ ft; abandoned well ✓ ft.

6. Well is intended to supply water for: Wash water + Cooling

7. DRILLHOLE:

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
8"	0	140	6"	0	600

8. CASING AND LINER PIPE OR CURBING:

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
8"	Std Blk Pipe	0	140
6"	Std Blk Pipe	0	269
6"	Sandstone	269	600

9. GROUT:

Kind	From (ft.)	To (ft.)

10. FORMATIONS:

Kind	From (ft.)	To (ft.)
Clay Red	0	25
Sandy Silt	25	70
Clay Red	70	105
Silt	105	130
Clay Red	130	155
Dirty Sandy Silt	155	182
Hard pan & small Rock	182	269
Sand stone	269	600

Construction of the well was completed on: March 15 19 54

The well is terminated 18 inches ☐ above, below ☐ the permanent ground surface.

Was the well disinfected upon completion? Yes ✓ No ____

Was the well sealed watertight upon completion? Yes ____ No ____

11. MISCELLANEOUS DATA:

Yield test: 35 Hrs. at 20 GPM.

Depth from surface to water-level: 40 ft.

Water-level when pumping: 200 ft.

Water sample was sent to the state laboratory at: By Owner City 19____

Signature Madsen Bros Registered Well Driller

Westlund Wis Complete Mail Address

Please do not write in space below

Rec'd ____ No. ____

Ans'd ____

Interpretation ____

2236

	10 ml	10 ml	10 ml	10 ml	10 ml
Gas—24 hrs.					
48 hrs.					
Confirm					
B. Coli					

Examiner ____