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PHASE II WORK PLAN
ENVIRONMENTAL INVESTIGATION OF MANUFACTURED GAS PLANT SITE
SHEBOYGAN, WISCONSIN

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1.0 EXECUTIVE SUMMARY

This work plan has been prepared by Simon Hydro-Search, Inc. for Wisconsin Public Service Corporation (WPSC) and the City of Sheboygan (City) in support of the proposed Phase II environmental investigation to be conducted at the former Sheboygan manufactured gas plant (MGP) site. The MGP facility manufactured gas used for lighting and heating as well as producing by-products which served as feedstocks for other chemical manufacturing operations. The plant operated between the period of approximately 1880 through 1930.

During construction of a foundation for the boat docking facility by the City in August 1990, dark oily material was encountered in an excavation along the shoreline. Simon Hydro-Search was contacted to perform a Phase I environmental investigation at the site to gather preliminary information to evaluate the presence/absence of conditions of potential concern to human health and the environment. The investigation conducted by Simon Hydro-Search consisted of test pit excavations, surface and subsurface soil sampling and ground-water sampling. Regional and local geology and hydrogeology, and the proximity of water supply wells to the site were also investigated.

Based on the results of this investigation, the following conclusions and recommendations were made.

Phase I Summary and Conclusions

- Soils impacted with organic compounds are generally confined to the subsurface in the central portion of the property. These impacted materials are near likely source materials, including the former water gas and gas meter shop, the purifier, and the tar storage tanks. A presumably localized area of impacts is present in the southern portion of the site near the relief holder foundation.

- No significant concentration of cyanide compounds, arsenic or nickel were detected in site test pit and surface soil samples.

- Based on grab ground-water sample results from test pits, ground-water containing organic impacts are present in the central portion of the site in the area of the former water gas and gas meter shop, purifier and tar storage tanks. Based on field observations and infrared spectroscopy analysis of a saturated soil sample from the gas holder and gas/oil tank area in the northern portion of the site, organic ground-water impacts likely occur in this area as well.

- Ground-water impacted with total (field filtered) cyanide concentrations are present at the site. The source of the elevated cyanide concentrations is unknown, as no significant concentrations of cyanide compounds were detected in site soil samples and no purifier wastes were observed during the investigation. However, the area near the former purifier was not investigated by Simon Hydro-Search as it is the current location of the City boat dock.

Phase II Work Plan Objectives

The objectives for the Phase II investigation are as follows:

- Establish static ground-water elevations and thickness of the unsaturated zone to quantify volumes of impacted soil;
- Determine vertical and horizontal ground-water flow gradients and aquifer parameters to enable evaluation of ground-water migration pathways and remedial options;
- Further evaluate the magnitude and extent of soil and ground-water impacts across the site.
- Evaluate the occurrence and nature of free hydrocarbon at the site to determine the potential for off-site sources.
- Perform soil and ground-water chemistry analyses to evaluate potential remediation alternatives.

Scope of Phase II Investigation

The Phase II investigation scope includes the following key elements:

- Nine soil gas probes will be installed in the vicinity of the relief holder on the southern portion of the site. Recovered soil vapors will be field analyzed to determine subsequent placement of the three soil borings.
- Eleven soil borings will be drilled and sampled to a depth of 8 to 30 feet. One soil sample from each borehole will be submitted for laboratory analyses of benzene, ethylbenzene, toluene and xylene (BETX) and polynuclear aromatic hydrocarbon (PAH) compounds. Three soil samples from tar soaked soils will be obtained for British Thermal Units analysis and ash content. Eight soil samples will be obtained and analyzed for percent grain size distribution.
- Seven water-table monitor wells, one piezometer, and one staff gage station will be installed at the site. The monitor wells and piezometer will be developed and hydraulically tested. All site monitoring points will be surveyed for elevation and location.

- Two rounds of ground-water chemistry samples will be obtained for laboratory analysis from the eight site ground-water monitor points. A total of 24 ground-water samples will be analyzed by the laboratory; 22 samples will be analyzed for BETX, PAHs, and cyanide compounds, and 2 samples will be analyzed for typical water treatment analytical parameters.
- If free product is observed floating on the water-table surface, hydrocarbon samples will be obtained for IR analysis to characterize the nature of the organics.
- Existing published sources will be consulted to determine information regarding the Sheboygan River, including the recreational uses, aquatic species, river flows, and flood levels.
- All obtained information will be compiled in a concise final Phase II investigation report.

2.0 INTRODUCTION

This work plan has been prepared by Simon Hydro-Search for Wisconsin Public Service Corporation (WPSC) and the City of Sheboygan (City) in support of the proposed Phase II environmental investigation to be conducted at the former Sheboygan manufactured gas plant (MGP) site (Figure 2-1). The MGP facility manufactured gas used for lighting and heating as well as producing by-products which served as feedstocks for other chemical manufacturing operations. The plant operated between the period of approximately 1880 through 1930.

The purpose of the Phase II environmental investigation at the former MGP site is to evaluate the lateral and vertical extent of contaminants in the site soil and ground water. The site hydrogeologic conditions will be determined, and the possibility of migration of impacted ground water from off-site sources will also be evaluated. A preliminary evaluation of potential remedial alternatives will also be prepared.

This work plan addresses the proposed scope of the investigation to be conducted during Phase II work at the site and incorporates procedures previously utilized by Simon Hydro-Search at other WPSC facilities. These procedures have previously met with the Wisconsin Department of Natural Resources (WDNR) approval and are expected to be acceptable for this investigation. This work plan has been prepared in accordance with the recommended procedures from the March, 1992 WDNR publication SW-157-92 entitled "Guidance for Conducting Environmental Response Actions".

Background information including an overview of the site history and previous investigation findings are presented in the following section (Section 3.0). The site-specific concerns and approach to the investigation are discussed in Section 4.0. This discussion encompasses the proposed sampling and analysis plan, and the site-specific health and safety plan. The project schedule is presented in Section 5.0. Quality assurance and quality control is described in the appendix.

3.0 BACKGROUND

3.1 Site History

The WPSC MGP site is located at 732 North Water Street in Sheboygan, Wisconsin (Figure 2-1). The MGP site is approximately 3 acres in size and is bounded by New York Avenue to the north, North Water Street to the east, Center Street to the south, and to the west by the Sheboygan River. Gas was manufactured at the facility between approximately 1880 and 1930 using coal and water gas processes. The gas plant buildings and structures have since been razed.

The property was sold in 1966 to Heileman Brewery who used the site for vehicle parking. Heileman sold the property in 1977, and it has been under the ownership of three other non-manufacturing companies until the City purchased the property in 1985. A complete listing of previous owners is included in Appendix A of the June 30, 1992 Simon Hydro-Search Phase I report. The potential for environmental impairment from property owners since WPSC is unknown although a neighboring toy manufacturer, Garton Toy, may have stored naphthalene on the north edge of the property in the past. The property is currently owned by the City and has been developed into a boat docking and RV camping area due to its accessibility to the Sheboygan River. The site is gravel covered.

Previously existing structures and existing structures relevant to this investigation are shown on Figure 3-1. This figure was produced after review of a WPSC survey map of the property dated July 13, 1923 and City survey maps of the property. Based on the information provided, the following aboveground structures were present on the site during MGP operations:

- Three gas relief holders,
- One gas/oil tank,
- Three tar tanks,

- One purifier, and
- Several gas manufacturing buildings and garage.

Existing structures of the site include a remnant foundation of a building and a foundation for a floating boat docking facility (Figure 3-1).

During construction of the foundation for the boat docking facility by the City in August 1990, a dark oily waste material was encountered in an excavation along the shoreline. A "worse case" sample of the waste was collected by the City and analyzed for a variety of organic and inorganic parameters by Ortek Environmental Laboratory. Compounds detected included polynuclear aromatic hydrocarbons (PAHs), benzene, ethylbenzene, toluene, and xylene (BETX), total petroleum hydrocarbons, and total/amenable cyanide. Based on information obtained from the City, other test pit excavations were dug and contained "visible contamination", however, none were sampled. The locations of previous test pits and sample locations could not be reliably determined based on the available documentation.

The wastes generated by the coal and water gas methods of gas manufacturing typically include coal tar residues and oxide box (purifier) wood chip wastes. Wood chips were commonly used at MPGs in the gas purification process. If produced at the Sheboygan site, the fate of the oxide box wastes is unknown. The fate of the coal tar wastes at the Sheboygan site is also not known although it is assumed that most of the coal tars were commercially marketed for other uses as was the case at many similar sites.

3.2 Phase I Investigation Results

Phase I investigation was carried out by Simon Hydro-Search in 1992. The Phase I investigation evaluated the site-specific soil and ground-water impacts via excavation of test pits, soil and ground-water sampling and laboratory analysis at the locations shown on Figure 3-2. The regional hydrogeology and location of nearby water supply wells was evaluated using available publications and information from the WDNR.

3.2.1 Regional and Site-Specific Geology and Hydrogeology

The Sheboygan MGP site is located adjacent to the Sheboygan River approximately 1 mile upstream from the confluence with Lake Michigan. The majority of the site is flat-lying and consists of sand and gravel fill material to a depth of 1.0 to 9.0 feet. Silty and clayey alluvial sand occurs below the fill material over most of the site, however, in the southern portion of the site a silty clay unit was encountered to a depth of 10 feet.

Unconsolidated materials in the area extend to a depth of approximately 50 to 95 feet below grade. The surficial bedrock in the area is the Niagara dolomite.

Ground water at the site probably occurs between 10 and 30 feet below grade, as the site is elevated approximately 10 to 35 feet above the Sheboygan River. Shallow ground-water flow at the site is probably to the south-southwest toward the Sheboygan River. Regional ground-water flow is to the East toward Lake Michigan.

The City obtains its municipal water supply from Lake Michigan. No private drinking water wells are known to be in operation within ½ mile of the site.

3.2.2 Soil and Ground-Water Chemistry Impacts

Based on the results of the Phase I investigation, the following conclusions regarding the site soil and ground-water chemistry can be made:

- No significant concentration of organic chemicals were present in the surface soils.
- Site soils impacted with petroleum-related organic chemical compounds are generally confined to subsurface soils in the central portion of the property (Figure 3-3). These impacts are present near the former water gas and gas meter shop, purifier, and tar storage tanks, all of which are likely source areas

for impacts. An additional area of impacts occurs in fill materials located on the southern portion of the site which appears related to the former relief holder. Based on the Phase I investigation findings, these impacted soils appear localized in extent.

- No significant concentrations of arsenic, nickel, or cyanide compounds were detected in surface or subsurface site soils.

- Based on grab samples of ground water, ground-water chemistry impacts with respect to petroleum-related organic compounds occur in the central portion of the site in the area of the former water gas and gas meter shop, purifier, and tar storage tanks. Based on field observations and infrared (IR) spectroscopy analysis of a saturated soil sample from the northern portion of the site, ground-water impacts likely occur in the vicinity of the gas holder and gas/oil tank area as well.

- All obtained site ground-water chemistry samples contain total cyanide and arsenic concentrations at or above the NR140 Enforcement Standard (ES) or Preventive Action Limit (PAL). The source of the elevated concentrations is unknown, as no significant concentrations of cyanide or arsenic compounds were detected in site soil samples and no purifier wastes were observed during the investigation. However, the area near the former purifier was not investigated by Simon Hydro-Search as it is the current location of the City board dock.

3.3 Regulatory Cleanup Standards and Issues

Per the WDNR guidance for conducting environmental response actions, standards for cleanup are media-specific, and are based on the potential to impact human health and safety.

Chapter NR140 of the Wisconsin Administrative Code defines ground-water standards. This statute specifies PALs and ESs for a series of compounds in ground water. Some of these compounds are associated with MGP sites, and are recommended for analysis.

Cleanup goals and standards for soils are being developed by the WDNR under the NR700 series regulations. WPSC and the City have considered the draft NR720 document in this investigation to the extent that it has been defined.

4.0 PHASE II WORK PLAN

4.1 Objectives

The objectives of the Phase II investigation are as follows:

- Establish static ground-water elevations and the thickness of the unsaturated zone to quantify volumes of impacted soil;
- Determine directions of ground-water flow and aquifer parameters to evaluate ground-water migration pathways and remedial options;
- Further evaluate the extent and magnitude of soil impacts across the site including a focused evaluation near the relief holder on the southern perimeter of the property; and
- Evaluate the horizontal and vertical occurrence and concentration of free and dissolved hydrocarbons, PAHs, and cyanide in ground water. This information will enable evaluation of the potential for off-site sources of impacts and help define ground-water remediation alternatives.

At this time, no surface water or sediment sampling is proposed due to the complexity of establishing sources of impacts which may be observed in the Sheboygan River.

4.2 Scope of Work

The objectives of the Phase II investigation will be met using the following scope of work:

- Eleven soil borings will be drilled and sampled to a depth of approximately 8 to 30 feet to determine the site geology and establish a vertical profile of soil impacts. One soil sample from each borehole will be retained for laboratory analysis of BETX and PAHs. Three soil samples from tar-soaked materials will be obtained and analyzed for British Thermal Units (BTU) content and ash content to assist in determining remediation alternatives. Eight soil samples, one from each borehole completed as a monitor well, will be analyzed for percent distribution of grain size per NR141 requirements.

- Seven water-table monitor wells and one piezometer will be installed to allow an evaluation of the site hydrogeologic conditions. Shallow ground-water flow directions, horizontal hydraulic gradients, and vertical hydraulic gradients will be determined.

- Nine soil gas probes will be installed in the vicinity of the relief holder tank on the south side of the property. Vapors from the soil gas probes will be analyzed in the field using a HNu photoionization detector (PID). The results will be used to define the extent of impacts in this area and focus the location of three of the eleven proposed soil borings.

- One staff gage station will be established in the Sheboygan River.

- The installed monitor wells will be developed, hydraulically tested and all site monitoring and investigation points will be surveyed. The hydraulic test information will allow calculation of the site ground-water travel time.

- Two rounds of ground-water samples will be obtained from the site monitor wells and piezometers. The ground-water chemistry results will be used to define the magnitude and the lateral and vertical extent of ground-water impacts. Ground-water samples will be laboratory-analyzed for BETX, PAHs, and the various forms of cyanide (soluble, weak acid dissociable, and amenable to chlorination).

- If free product is observed, hydrocarbon samples will be obtained for IR analysis to characterize the nature of the organics.

- Two ground-water samples will be obtained for laboratory analysis of typical water treatment required parameters including pH, total organic carbon (TOC), carbonate oxygen demand (COD), oil and grease, chlorides and total suspended solids (TSS).

- Existing published sources will be consulted to determine information regarding the Sheboygan River, including the recreational uses, aquatic species, river flows, and flood levels.

- All obtained information will be compiled in a concise final Phase II investigation report.

4.3 Field Investigation Methods

4.3.1 Soil Gas Survey

A soil gas survey will be completed in the vicinity of the former relief holder on the southern perimeter of the property. High PID readings were detected during the field program in the Phase I investigation in this area. Evaluation of the results of the soil gas survey will focus the location for installation of three soil borings in this area.

Nine soil gas probes will be installed. In-situ soil gases will be screened in the field with an HNu PID to evaluate the likely extent of impacts. The small diamter probes will be installed using a hydraulic drive system and will consist of a perforated drive point connected to flexible tubing. The soil gas probes will be driven approximately 3 to 5 feet below ground surface.

Upon installation, gas within the probes will be extracted using a SKC air sampling pump. The recovered soil gas will either be directly monitored by an HNu PID or the gas will be contained in a tedlar bag prior to PID analysis. A minimum of five probe volumes of gas will be recovered prior to field analysis. The PID will utilize an 11.7 eV probe and will be calibrated immediately prior to use. Calibration and the frequency of calibration will be performed for the WDNR guidelines and the manufacturer's recommendations as described in the Quality Assurance/Quality Control (QA/QC) Plan in Appendix A.

The results of the soil gas survey will be evaluated and interpreted. The subsequent location of three soil borings will be determined based on the soil gas survey results.

4.3.2 Drilling and Soil Sampling

Twelve soil borings will be drilled at the site at the locations shown on Figure 4-1. Seven of the soil borings (MW-101 through MW-107) will be drilled to a depth of approximately 15 feet and completed as water-table monitor wells. One soil boring (P-101) will be drilled to a depth of approximately 30 feet and completed as a piezometer. Three soil borings will be drilled to a depth of approximately 8 feet at locations defined pending the results of the soil gas survey, and one soil boring (B-101) will be drilled in the center of the site to a depth of approximately 8 feet. The four proposed borings completed to 8 feet will be refilled and abandoned with granular bentonite upon completion.

Prior to drilling at the site, Diggers Hotline will be called to locate all utilities in the proposed drilling locations. The City and WPSC will be contacted to determine the location of private utilities, water lines, and any other known objects which may be buried at the site. Alternate borehole locations will also be cleared at each proposed borehole location in the anticipation of auger refusal.

The hollow stem auger drilling technique will be used for all drilling at the site. The hollow stem auger technique is the preferred method because it causes minimal disturbance to the geologic formation and can be used without the introduction of drilling fluids. If auger refusal is encountered, the borehole will be shifted to a new location and redrilled until the targeted depth is reached.

In all borings, soil samples will be collected continuously in advance of the drill bit using 2-foot long standard split-barrel sampling techniques (ASTM Method D 1586-84). Each sample will be visually classified by a Simon Hydro-Search geologist in accordance with ASTM Method D 2488-84, using the United Soil Classification System (USCS). Descriptions will be recorded on WDNR Soil Borehole Log forms (Appendix B). The descriptions will include applicable information pertaining to grain size distribution, organic material content, gradation, plasticity, color (using Munsell notation), odor (if any), moisture content, blow counts, percent recovery, grain shape and lithology, soil structure, layering, jointing, lenses, fractures, void space, photoionizable constituent content, depositional amount, and USCS group symbol.

Immediately upon recovery of the soil sample, a portion of each split-spoon sample will be placed in a laboratory-provided glass jar with a teflon-lined cap, pending final selection of the depth interval to be used for laboratory analysis. Soil will completely fill the jar to minimize volatile compound loss to headspace. The jar will be labeled with the project number, borehole identification, sample depth, date, time, sample type (grab or composite), and sampler per procedures in Appendix A. The soil sample will be kept in a cooler chilled to approximately 4 °C.

A second portion of the split-spoon soil sample will be transferred into a mason jar for headspace analysis. The soil headspace analysis procedures are described in the QA/QC Plan in Appendix A. Soil headspace measurements will be recorded on PID Data Summary sheets (Appendix B) and on the soil borehole log and the highest PID reading in each borehole will be noted. The PID data will be used to determine which soil samples will be submitted for laboratory chemical analysis. One soil sample from each borehole with the most elevated PID result will be submitted for laboratory analysis. Samples selected for laboratory analysis will be properly packaged and shipped to the laboratory under chain-of-custody procedures as described in Appendix A. The remaining soil samples will be discarded in drums and kept on-site pending determination of disposal alternatives.

Per WDNR guidance, a total of 12 soil samples will be obtained for laboratory analysis, one soil sample from each of the 12 borings. The soil samples will be submitted for laboratory analysis under chain-of-custody procedures. The samples will be analyzed for BETX and PAHs per the methodologies listed in Table 4-1. The targeted laboratory detection limits and sample holding times are also listed in Table 4-1.

Eight soil samples will be obtained for laboratory analysis of the percent distribution of grain size. One sample of unconsolidated material from each borehole completed as a monitor well or piezometer will be obtained. Per NR141 requirements, the soil sample will be obtained from the screened interval of each monitor well or piezometer. Laboratory analysis for percent distribution of grain size will be per standard ASTM methods.

All drill cuttings and subsurface soil materials recovered during drilling will be drummed and stored on-site per the procedures specified in Section 4.3.8. Strict decontamination procedures as specified in the QA/QC Plan in Appendix A will be followed during all drilling and soil sampling activities.

4.3.3 Monitor Well and Piezometer Installation

Seven monitor wells, MW-101 through MW-107, and one piezometer, P-101, will be installed at the site at the locations shown on Figure 4-1. The purpose of these devices are to provide ground-water elevation data, ground-water samples for chemical analyses, determine thicknesses of floating-phase products, and allow the evaluation of approximate subsurface hydraulic conductivity information. The proposed monitor well locations have been selected to define the lateral and vertical extent of impacts and target areas of previously determined or suspected impacted ground water.

Well installation will be performed inside the hollow stem augers. At the conclusion of drilling, the borehole will be flushed, if necessary, using a drilling rod or tremie pipe inserted to the bottom of the borehole. Clean water will be circulated until the borehole has been flushed free of drill cuttings and relatively clear fluid flows from the top of the borehole. The total depth of the borehole will then be measured using a tape measure or measuring rod. Water used to flush the borehole will be recovered and retained on-site in labeled drums.

The seven monitor wells will be constructed to an approximate depth of 15 feet below grade and the one piezometer will be installed at 30 feet below grade. The monitor wells are intended to be installed as water-table wells, so the final completion depth will be dependent upon the depth to the water-table surface. The monitor wells and piezometer will be constructed per the requirements of NR141. A typical water-table well construction is depicted on Figure 4-2.

The monitoring wells and piezometer will be constructed of new 2-inch internal diameter (ID) polyvinyl chloride (PVC) well casing. A protective casing consisting of an 8-foot length of metal casing with a lockable cap will also be installed. The ID of the protective casing will be a minimum of 2 inches larger than the ID of the well casing, per NR141. Well casings, couplings and screens will be steam-cleaned and sealed in plastic prior to use or will remain sealed in factory plastic until use. The well casings and screens will be visually inspected for defects per NR141.07(4) and defective material will not be used.

Well packing and sealing material will adhere to specifications set forth in NR141.11, and NR141.13. Sizing of the silica sand or gravel filter pack material will be determined by the recommendations provided in the NR141 regulations. The well casing will extend at least 20 inches above the ground surface. The amount of packing and sealing materials required will be calculated prior to installation based on the diameter of the borehole less the casing diameter, and the linear footage of packing or sealing materials required. Filter pack material for water-table wells will be installed from 6 inches below the bottom of the well screen. The well screen and casing will then be inserted through the center of the borehole by personnel wearing clean gloves. Filter pack material will then be installed in the annular space between the well and the borehole walls to 2 feet above the top of the well screen. Due to the shallow depth to the water-table surface, the filter pack may extend only 0.5 feet above the top of the screen. A weighted tape measure or measuring rod will be used to ensure the pack material is installed evenly and over the proper depth interval. If the packing material bridges, it will tamped into place.

Thicknesses of the filter pack, filter-pack seal, bentonite seal, annular space seal, and ground-surface seal may be shortened to accommodate shallow water-table conditions. For ideal conditions, the following materials and thicknesses will be used. A 2-foot thick filter pack seal comprised of clean, fine-grained sand will be placed above the filter pack material, and a 2-foot thick granular bentonite seal will be placed above the filter pack seal, per NR141.13. The depth interval for the fine sand and bentonite seals will be similarly measured and, if necessary, the seal will be tamped into place. The remaining annular space will be sealed with either bentonite cement grout granular bentonite, or bentonite pellets.

If a grout is used as an annular space seal, it will be tremied into place, according to specifications in NR141.10. If bentonite granules or pellets are used, they will be poured freely down the borehole per NR141.13(2)(b). If a slurry or grout annular space seal is used, the protective casing will not be installed until a minimum 12-hour waiting period has elapsed and any grout or slurry settlement has been topped off, per NR141.13(2)(b)3.

The protective casing will be centered over the well casing prior to installing the ground surface seal. The protective casing will extend from at least 5 feet below the ground surface to at least 2 feet above the ground surface, and will be placed such that the well casing is no more than 4 inches below the top of the protective casing. The ground surface seal will then be installed between the borehole wall and the protective casing.

If bentonite is used as a ground-surface seal, it will extend from the 5 feet below the ground surface to 1-foot below the ground surface, and topsoil will be placed in the remaining annular space and slope away from the protective casing. If concrete is used as the ground-surface seal, it will extend from 5 feet below the ground surface to above the ground surface, and will be finished to slope away from the protective casing (Figure 4-2). The annular space between the well casing and the protective casing will be filled to the top of the surface seal with bentonite pellets. A ¼-inch diameter hole will be drilled through the protective casing to allow water which may collected between the casings to drain out.

The calculated and actual amounts of each type of material used to construct the monitoring wells and piezometer will be recorded. Well construction data will be recorded per NR141.23 requirements on a WDNR Well Construction Diagram #4400-113A and a WDNR Well Information Form #4400-89. Forms #4400-89 and #4400-113A will be submitted to WDNR with a final report on investigative findings. An example of each form is presented in Appendix B.

4.3.4 Well Development and Hydraulic Testing

Following installation, all new monitor wells and piezometers will be developed after a minimum waiting period of 12 hours per NR141.21. Wells and piezometers will be developed using either a pump or a bailer or a combination of the two to remove the effects of drilling and installation operations. If a monitor well or piezometer can be purged dry, development will consist of slowly purging the well dry to limit agitation. Per NR141.21(2), development is complete when five well volumes have been removed, or sediment-free water is produced. If a monitoring well and piezometer cannot be purged dry, it will be developed by alternately surging and purging the well for a minimum of 30 minutes per NR141.21(1), and then pumping or bailing until 10 well volumes are removed or until sediment-free water is produced.

One well volume is calculated as follows:

$$\pi H_1(D_1/2)^2 + \pi n H_2[(D_3/2)^2 - (D_2/2)^2]$$

Where:

D_1 = inner diameter of well casing (ft)
D_2 = outer diameter of well casing (ft)
D_3 = borehole diameter (ft)
H_1 = height of water column in well casing (ft)
H_2 = length of filter pack or height of water column, whichever is less (ft)
n - porosity of filter pack

Periodic measurements and observations of field parameters including temperature, specific conductance, pH, visual appearance and odor will be made and recorded on Well Development/Purge Summary Forms (Appendix B) as each well is developed. In addition, time expended in development, volume of water removed, and any sedimentation present in the bottom of each well before and after development will be noted. Water level measurements will be obtained prior to and following development, and following water level stabilization. All recovered purge water will be drummed, labeled and stored on-site until laboratory analytical results are received and appropriate methods for disposal of the purge water can be determined. Impacted purge water is regulated under NR141.17 and handling procedures are described in Section 4.3.8.

Following the completion of well development in each well, the water level will be allowed to recover back to static and a hydraulic test will be performed. Hydraulic testing will involve performing either a bail-recovery test or a slug test. If a bail-recovery test is performed, water will be removed from the well using either a well development pump or a dedicated bailer. In highly impacted wells, a slug will be used to create a head loss. The water levels during the test will be measured using an electronic water level probe (WLP) or a 10-psi pressure transducer coupled to a data logger. All water removed during the test will be collected in 55-gallon drums and handled per the criteria described in Section 4.3.8

Calculations of the in-situ hydraulic conductivity will be made using the recovery data via the methods described by Hvorslev, Bredehoeft and Papadopulos, Bouwer and Rice, or

Jacob. After completion of the test, all equipment will be removed from the well and decontaminated using the procedures described in the QA/QC Plan in Appendix A.

4.3.5 Staff Gage Construction

One staff gage will be established on-site on the banks of the Sheboygan River. The purpose of the staff gage is to determine the elevation of the River surface and evaluate the surface-water/ground-water interaction. The staff gage will consist of a heavy gauge steel fence post which will be driven adjacent to the River to a depth of several feet to serve as a surveyed reference point for surface-water elevation measurements. The staff gage will be located in an out-of-the way location to avoid interfering with pedestrian or river traffic.

4.3.6 Surveying

Survey control will be performed following installation of the monitor wells, piezometer, soil gas probes, boreholes, and staff gage station. Vertical elevations to the top of each new well casing and the staff gage will be established by survey to within ±0.01 foot. Elevations will be referenced to mean seal level (msl) per the United States Geological Survey datum.

Lateral locations based on the established grid system will be determined for each surveyed location. Lateral locations will be calculated to within ±1 foot per NR141.065. All well and piezometer locations and elevations will be documented on WDNR Well Information Forms #4400-89 and Monitoring Well Construction Forms #4400-113A (Appendix B). Per NR141.065, the site map will include well and piezometer locations, structure boundaries, property boundaries, nearby surface water, a scale, a north arrow, and the site grid system origin according to either the state plane coordinate system or latitude or longitude. In addition, an 8½ x 11-inch map dimensioned to scale showing the location of wells, piezometers, and structures on the site will be submitted to the State per NR141.065.

All surveying will be performed by a state licensed surveyor. Surveying procedures will be per the accepted practices of the state.

4.3.7 Ground-Water Sampling

A total of 25 ground water and Light Non-Aqueous Phase Liquids (LNAPL) samples will be collected at the site. Two rounds of ground-water sampling will be performed at the eight proposed ground-water monitor wells and piezometer. During each sample event, WDNR guidelines require obtaining one replicated sample, one field blank sample, and one trip blank sample, bringing the total number of ground-water samples obtained per sample event to 11. The ground-water samples will be analyzed for BETX, PAHs, and the cyanide species (weak acid dissociable cyanide, amenable to chlorination cyanide, and soluble cyanide). The trip blank sample for each sampling event will only be analyzed for BETX compounds.

In addition, one sample of free product (LNAPL), if present, will be recovered and submitted for IR analysis, and two samples of ground water will be obtained for analysis of pH, TOC, COD, oil and grease, chlorides, and TSS.

The purpose of ground-water sampling is to determine the magnitude and lateral and vertical extent of impacted ground water. Two ground-water sampling events will be completed at the site to determine the variability of the ground-water chemistry over time. The IR analysis of the LNAPL is being performed to determine the nature of the floating product and the potential sources of the product. The two ground-water samples obtained for analysis of additional parameters are necessary for the evaluation of waste water treatment permitting requirements.

Sampling activities will be performed as described in the QA/QC Plan in Appendix A. A description of key sampling elements are described below.

4.3.7.1 Presampling Activities

The locking and protective caps to the well will be removed. The air in the well casing will be screened for the presence of organic vapors using an HNu PID. Any damage to the well or piezometer will be noted.

Static liquid levels and thicknesses of immiscible layers, if present, will be measured prior to sampling. The total well depth will also be determined at this time and compared to well construction records. Following static liquid level measurements any LNAPL to be sampled will be collected. If measurable LNAPLs are present, a ground-water sample will not be obtained from that sample location. If LNAPLs are not present, the well will then be evacuated, and ground water will be sampled.

The static liquid level measurements will be collected using a Solonist electronic WLP. The WLP will be lowered into the well to the approximate depth of the fluid level based on historical fluid level elevation data. The WLP will then be submerged in the fluid to complete an electrical connection which activates the probe indicator light or buzzer. The precalibrated length of cable in the well will be recorded to the nearest 0.01 foot. To provide consistent measurements, the measuring point on the well casing will be permanently marked. The static fluid elevation in the well can be calculated by subtracting the depth to water from the elevation of the well casing lip.

The electronic WLP does not differentiate between water and immiscible layers. To determine if an LNAPL phase is present, each well suspected of containing LNAPL will be tested using a Keck interface probe.

Upon removal of the WLP, the nature of the fluid on the probe will be noted. If the fluids indicate LNAPL may be present in the well, the thickness of the LNAPL will be measured using a Keck interface probe. The interface probe emits a different tone when in contact with LNAPLs and water. The thickness of the LNAPL can be determined by noting the difference in depths between the triggering of the two tones.

Liquid level measurements will proceed in order from least impacted ground water to most impacted ground water to minimize the potential for cross-contamination. Prior to the initial sampling round, evaluations of least to most impacted ground water will be performed based on the appearance of the ground water during well development. The probes will be thoroughly decontaminated between wells by washing with a non-phosphate detergent solution and triple rinsed with distilled water.

The total depth of wells will also be measured prior to sampling using the WLP or interface probe to determine the presence or absence of siltation.

Depth to water or LNAPL measurements will be recorded to the nearest one-hundredth of a foot in the site field book, and on water level data forms (Appendix B), along with the time and date of the measurement, the measuring device, the name of the person taking the measurement, and any additional comments. The elevation of the fluid level referenced to msl will also be calculated and recorded.

4.3.7.2 LNAPL

For wells containing measurable thickness of LNAPLs, the LNAPL will be sampled and the ground water from that well will not be sampled. LNAPL sampling will be performed using a peristaltic pump or a modified double check valve PVC bailer. The pump or bailer will be used to skim a sample from the liquid surface in the well with a minimum of agitation. If a bailer is used, it will be modified to allow filling from the top. The bottom check-valve will be sealed off with a PVC plug, and the ball from the top check-valve will be removed. A length of 1-inch diameter stainless steel pipe will be placed on the retrieval line above the bailer to counteract the buoyancy effect of the bottom seal.

As with all ground-water sampling procedures, individually dedicated equipment will be used for all supplies which contact the sample. If more than one LNAPL sample is required, replacement hose for the peristaltic pump will be inserted or individually dedicated bailers will be used. All sampling activities will be performed wearing clean, powderless PVC gloves.

The LNAPL samples will be collected in 40 ml vials with teflon-lined caps and stored in a cooler at a temperature of 4 °C. After all LNAPL samples have been collected, they will be transported as hazardous samples to the analytical laboratory. All obtained LNAPL samples will be submitted for IR analysis to characterize the nature of the organics.

4.3.7.3 Ground-Water Sampling Procedures

All ground-water sampling procedures will be completed per the 1987 WDNR document #WR-153 entitled Groundwater Sampling Procedures. To minimize the potential for cross-contamination, the wells will be sampled in order progressing from areas of low ground-water impacts to higher ground-water impacts, based on results of previous ground-water sample analyses. For the initial ground-water sampling event, the sampling order will be determined based on field observation of the ground water during development.

Prior to ground-water sample collection, stagnant water will be purged from each sampled well so that samples will be representative of in-situ ground-water quality. Each well will be purged of four casing volumes of fluid. Volumes will be calculated using equation (1) from Section 4.3.4. Purging of the well will be performed using dedicated PVC bailers. Plastic will be placed on the ground surrounding each well to prevent contact with the ground surface.

The volume of recovered ground water will be measured using a calibrated bucket. All purge water will be sorted on-site in drums until laboratory analytical results are received and disposal alternatives for the purge water can be determined.

During purging, measurements will be periodically obtained for pH, specific conductance, and temperature using a Cole Parmer digital pH meter, a YSI Model 33 S-C-T meter, and a glass thermometer, respectively. Operating procedures for the instruments are detailed in the QA/QC Plan in Appendix A. Samples will be collected for laboratory analysis when pH, conductivity, and temperature are stabilized or when four casing volumes have been removed from the well. Measurements made during purging will be recorded on Well Development/Purge Summary forms (Appendix B).

After the completion of purging, ground-water samples will be collected using dedicated PVC bailers and a dedicated PVC bottom emptying device.

The appropriate sample bottles will be obtained from the laboratory prior to sampling. The sample bottles will be filled in the following sequence based on the volatility of the parameters to be analyzed as recommended by the Environmental Protection Agency (EPA):

- Volatile Organics (BETX Compounds)
- Semi-Volatile Organics (PAHs)
- Cyanide Compounds

Additional routine compounds (pH, TOC, COD, oil and grease, chlorides, and TSS) will be sampled at two wells, probably MW-101 and MW-107. These compounds will be sampled after the BETX, PAHs, and cyanide compounds have been obtained.

With the exception of the cyanide compounds, none of the ground-water chemistry analytical parameters require field filtration. QA/QC procedures proposed to be utilized during the ground-water sampling (Appendix A) comply with the recommended procedures of the WDNR. QA/QC procedures include obtaining replicate samples, field blank samples, and trip blank samples.

One replicate sample will be obtained per sample event from the well with the highest suspected concentration of organics in the ground water. The replicate sample is obtained to evaluate the reproductibility of the analytical results. The replicate sample will be obtained simultaneously with the actual ground-water sample. The BETX vials will be filled for both samples, followed by the PAH bottles for both samples, and finally the cyanide bottles for both sample sets.

Filtration will be performed in the field for sampling of the cyanide compounds. Field filtration will be performed using a 0.45 micron in-line disposable filter and a peristaltic pump. Filters will be dedicated to each sample and will not be re-used. An individually dedicated, clean, plastic transfer vessel will be used to hold the ground water prior to filtration. The transfer vessel will be marked and discarded after use. Filtration will occur immediately after sampling of each well. Prior to filtration, 500 milliliters of distilled water will be run through the peristaltic pump hose and filter to flush residual water. For sampling, 250 milliliters of sample water will be run through the hose and filter prior to adding any sample water to the laboratory containers. Once the sample bottles are filled, the filter will be discarded, the external surface of the pump hose will be thoroughly rinsed with distilled water, and 500 milliliters of water will be pumped through the system.

One field blank sample will be obtained per sample event. The field blank sample will be obtained using a dedicated PVC bailer immediately after sampling and decontamination of the bailer has been completed. The field blank sample will consist of distilled water which will be poured into the sampler bailer and used to fill the sample bottles in the same fashion as any other ground-water sample. The purpose of the field blank sample is to evaluate the thoroughness of the sample equipment decontamination.

The trip blank sample will be provided by the laboratory and will consist of laboratory grade deionized water. One trip blank sample will be analyzed per sample event. The trip blank sample will be analyzed for BETX compounds. The purpose of the trip blank sample is to evaluate whether sample contamination could occur from the laboratory or from migration between the sample bottle septa.

Field analysis of the ground water will be performed at the time of sampling. Field analytical parameters will include specific conductivity, pH, temperature, and alkalinity.

Field analyses will be performed per the recommended procedures of the equipment manufacturer as described in the QA/QC Plan in Appendix A.

Ground-water sampling data will be recorded on appropriate field forms, including the appropriate Chain-of-Custody forms, Water Quality Sampling and Analysis forms, and Well Development/Purge Summary forms (Appendix B). Any additional data readings or comments will be noted in Simon Hydro-Search field notebook(s).

Laboratory analysis of the ground-water samples will be performed using a state certified analytical laboratory. Samples, parameters, analytical procedures, and anticipated detection limits are summarized on Table 4-1.

4.3.8 Field-Generated Waste Handling and Disposal Procedures

Because of the high potential for soil or ground-water impacts at some of the proposed borehole and monitor well locations, it will be necessary to implement procedures for the collection, handling, and disposal of potentially impacted solids or fluids removed from the boreholes or monitor wells.

Potentially impacted materials include drill cuttings, ground water and/or non-Aqueous Phase Liquids removed from the boreholes or monitor wells during drilling, development, hydraulic testing, purging or sample collection. In addition, water and/or soil produced during decontamination of the drilling and sampling equipment may require treatment and disposal. Any potentially hazardous waste will be containerized and stored on-site until disposal alternatives have been evaluated.

All potentially impacted materials will be collected and stored in drums until a determination can be made as to the degree of contamination and proper handling, disposal, or treatment procedures. The drums will be labeled and a record will be maintained for each drum. The label will include the type of material contained in the drum, the source of the material, and the date(s) the material was collected. The drums will be tightly sealed and stored on-site until disposal can be evaluated as part of site remediation.

The disposal procedures for field-generated impacted solids and fluids will be determined based on field PID measurements and laboratory analytical results.

The final disposal procedures will be the responsibility of WPSC.

Efforts will be made to consolidate field-determined non-impacted materials and impacted materials. Drill cuttings with organic odors and/or detectable concentrations of organic vapors using the PID will be grouped together in drums, and drill cuttings which do not demonstrate odors or PID detections will be isolated in separate drums. Similarly, ground water produced during well development, hydraulic testing, and presample purging will be grouped in drums based on field interpretation of contamination. Obviously impacted fluids containing LNAPLs will be isolated from fluids which contain no discernible odor. Depending upon the volume of water required to be purged from each well, efforts will be made to isolate the fluids from each well in separate drums. Maintaining isolation of fluids from separate wells may minimize the total amount of material which requires disposal.

4.4 Health and Safety Protocols

The detailed Simon Hydro-Search Health and Safety Plan for this investigation is included in Appendix C. Key elements of the Health and Safety Plan are detailed below.

Prior to any intensive investigative activities (drilling, soil gas probe installations, etc.) public and private utilities will be located. Diggers Hotline, WPSC and the City will be notified to clear the proposed drilling locations. Alternate drilling locations will also be cleared should auger refusal necessitate moving proposed drilling locations. If necessary, boring locations will be slightly relocated to avoid encountering utilities.

A Health and Safety Plan meeting will be held with all on-site workers, subcontractors, and visitors. This meeting will review the site Health and Safety Plan, will identify the potential hazards at the site, and will describe the methods of evaluation for selection of the levels of personal protective equipment.

All soil gas probe and drilling activities will be performed under Level "D" safety procedures, which involves the wearing of a chemical protective suit, chemical resistant gloves, boot covers, steel-toed shoes, a hard hat, and safety glasses. Due to the potential hazards at the site, the breathing space of the working area will be regularly monitored for vapors to determine the potential need for upgrading the safety procedures to Level "C". Level "C" safety equipment essentially includes all the equipment specified in Level "D" plus a respirator.

The breathing space will be regularly monitored during intrusive activities for organic vapors using a HNu Model PI-101 PID with an 11.7 eV probe. The potential for explosive gases will be monitored using a combustible gas indicator, and the possible presence of hydrogen cyanide gas will be monitored continuously using a Monitex meter. Action levels for each type of monitoring are included in the Health and Safety Plan in Appendix C and included upgrading to Level "C" when organic gas concentrations in the breathing space reach 2 to 5 parts per million (ppm). If hydrogen cyanide gas exceeding 1 ppm is encountered in the breathing space, work will be discontinued until further assessment can be performed. If the lower explosive limit exceeds 25% or the oxygen levels exceed 25% or drop below 19.5%, work will be temporarily halted pending further evaluation.

During well development, hydraulic testing, and ground-water sampling activities, the well headspace will be monitored using a HNu PID immediately after opening the well. If the PID levels in the well headspace and the breathing space near the well are lower than 5 ppm, then these activities will be performed under Level "D" safety procedures. If the well headspace and breathing space concentration exceed 5 ppm, then these activities will be performed under Level "C" safety procedures.

Handling of all subsurface equipment will be performed under Level "D" conditions. Decontamination involving the use of a steam cleaner or sprayer will be performed under Level "C" protection with a face splash shield.

4.5 Sheboygan River Evaluation

Data concerning the Sheboygan River will be compiled from a variety of published and public information sources. Information to be obtained will include:

- Recreational uses of the Sheboygan River (i.e., fishing, swimming, etc.) and river classification;
- Types of aquatic species in river for evaluating fishing and potential ecological effects;
- River flows (average volumetric flow rate, river cross-sectional area, location of river bottom); and
- Flood stage levels of the Sheboygan River.

4.6 Data Analysis and Report Preparation

All field and laboratory analytical data will be compiled in a Phase II investigation report. The report will detail all investigation findings and methods in a concise manner, and all supporting data and documentation will be included as Appendices materials. The scope of the report will fulfill proposed WDNR submittal requirements which are being developed under NR700.

The report narrative will be supported by summary tables of analytical data and figures illustrating site-specific geologic cross-sections, water-table maps, areas of site impacts, and other graphics to clearly convey the technical information. Simon Hydro-Search reports also contain all raw data collected during the course of investigation which are included as appendices. These data would include boring logs, well construction reports, well purging and development summaries, field data documenting ground-water sampling purge volumes and field measurements, water elevation measurements, hydraulic conductivity test results, HNu calibration logs, textural analysis results, analytical laboratory reports and other data collection efforts.

5.0 SCHEDULE

A graphic schedule of the proposed work plan is presented in Figure 5-1. A Phase II investigation meeting will be held prior to the initiation of any field activities. The meeting will be held on-site and will be coordinated with the utilities clearance for subsurface investigations.

Soil gas probe installation will be the initial field activity. The probes will be installed in 1 day and the soil vapors will be analyzed the following day. This information will be used to determine the location of three of the subsequent soil borings.

Drilling, monitor well installation, and stream gage station installation will take place the following week. These activities should take approximately 3 to 5 days. Immediately upon completion of the well installations, well development, hydraulic testing, and surveying will take place. Well development and hydraulic testing should take 2 to 3 days.

The first round of ground-water sampling will occur after development is complete. The second round of ground-water sampling will occur approximately 4 weeks after the initial round of sampling. The second round of sampling will not occur until the laboratory analytical results from the initial sampling round have been received.

Data analysis will be performed intermittently throughout the project as new pieces of information are obtained. Report preparation is expected to take approximately 2 to 4 weeks and will be completed after receipt of the second round of laboratory analytical results.

6.0 REFERENCES

Gas Research Institute, 1987, Management of Manufactured Gas Plant Sites, Volume 1, Wastes and Chemicals of Interest, October, 1987 Publication GRI-87/0260.1, GRI, Chicago, Illinois, October, 1987, 82 pages.

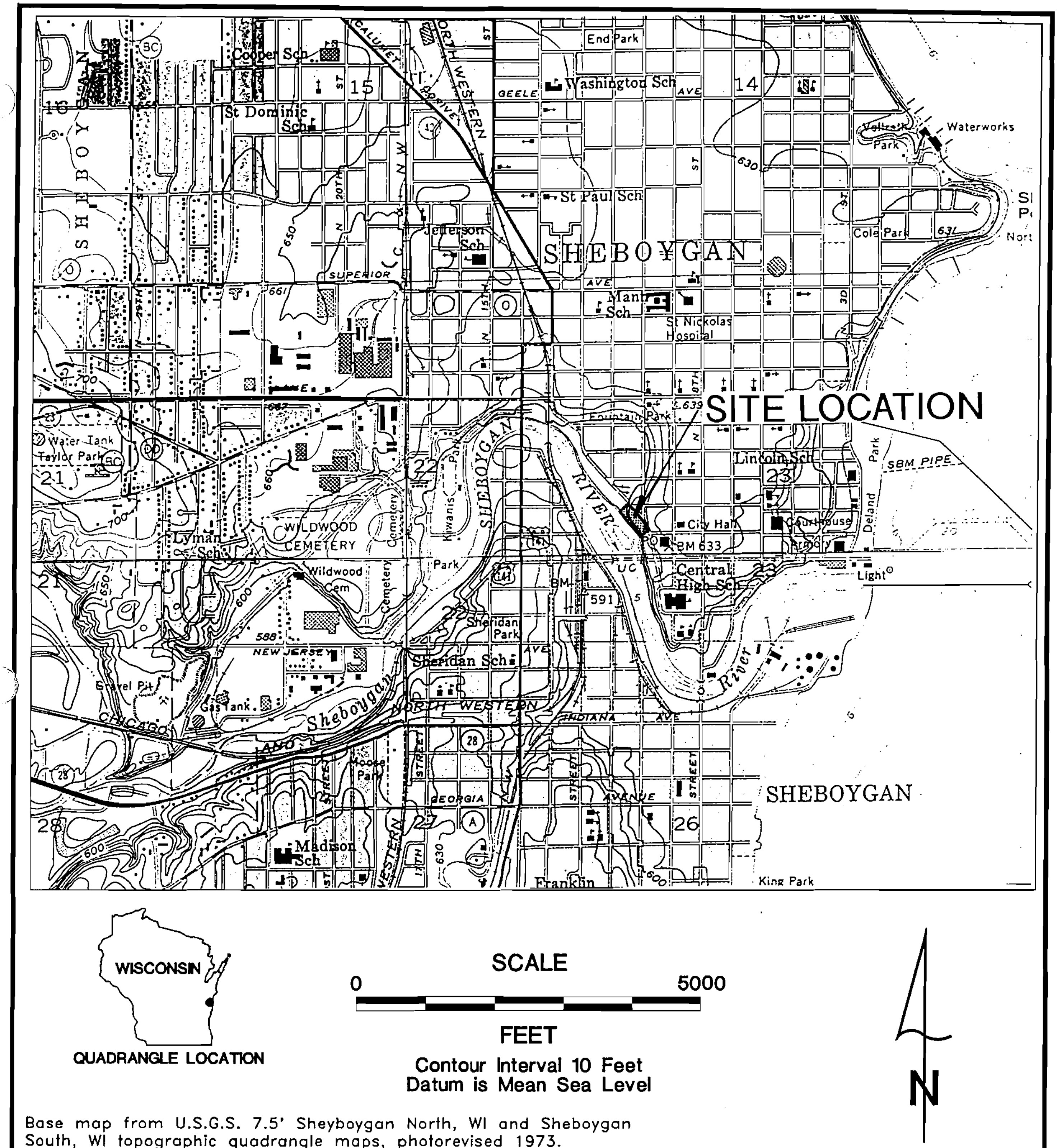
Simon Hydro-Search, 1992, Phase I Environmental Investigation Manufactured Gas Plant Site, Sheboygan, Wisconsin, June 30, 1992, Prepared for Wisconsin Public Service Corporation.

Simon Hydro-Search, 1992, Phase II Investigation Proposal, July 21, 1992, 11 pages.

State of Wisconsin, March 2, 1989, Draft Memorandum; Investigation and Cleanup at Former Coal Gasification Gas Plant Sites - Guidance, File Ref: 4440

WDNR, 1987, Ground-Water Sampling Procedures Guidelines, February, 1987, Publication PUBL WR-153-87, WDNR, Madison, Wisconsin, 91 pages.

Wisconsin Department of Natural Resources, 1992, Guidance for Conducting Environmental Response Actions, March, 1992, Publication PUBL SW-157-92, WDNR Emergency and Remedial Response Section.



Contour Interval 10 Feet
Datum is Mean Sea Level

Base map from U.S.G.S. 7.5' Sheyboygan North, WI and Sheboygan South, WI topographic quadrangle maps, photorevised 1973.

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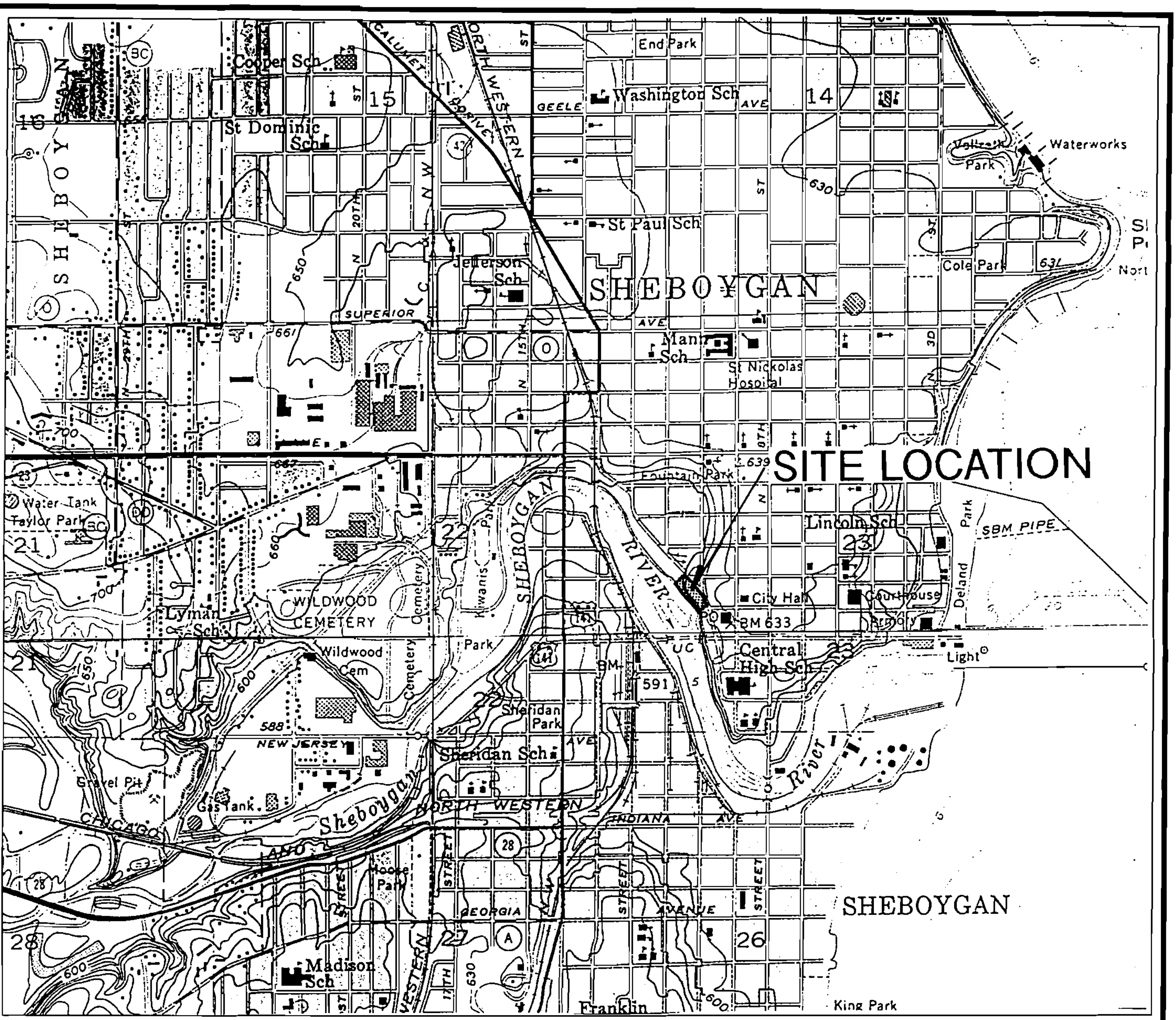
WISCONSIN PUBLIC SERVICE CORPORATION
SHEBOYGAN, WISCONSIN

SITE LOCATION and LOCAL TOPOGRAPHY

Dsgn. by:	Chk. by:	Apprv. by:
PROJECT: 453114843	DATE: 07/16/91	

DRAWING NO.: 1484-4

FIGURE: 2-1



QUADRANGLE LOCATION

SCALE

0 5000

FEET

Contour Interval 10 Feet
Datum is Mean Sea Level

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Base map from U.S.G.S. 7.5' Sheyboygan North, WI and Sheboygan South, WI topographic quadrangle maps, photorevised 1973.

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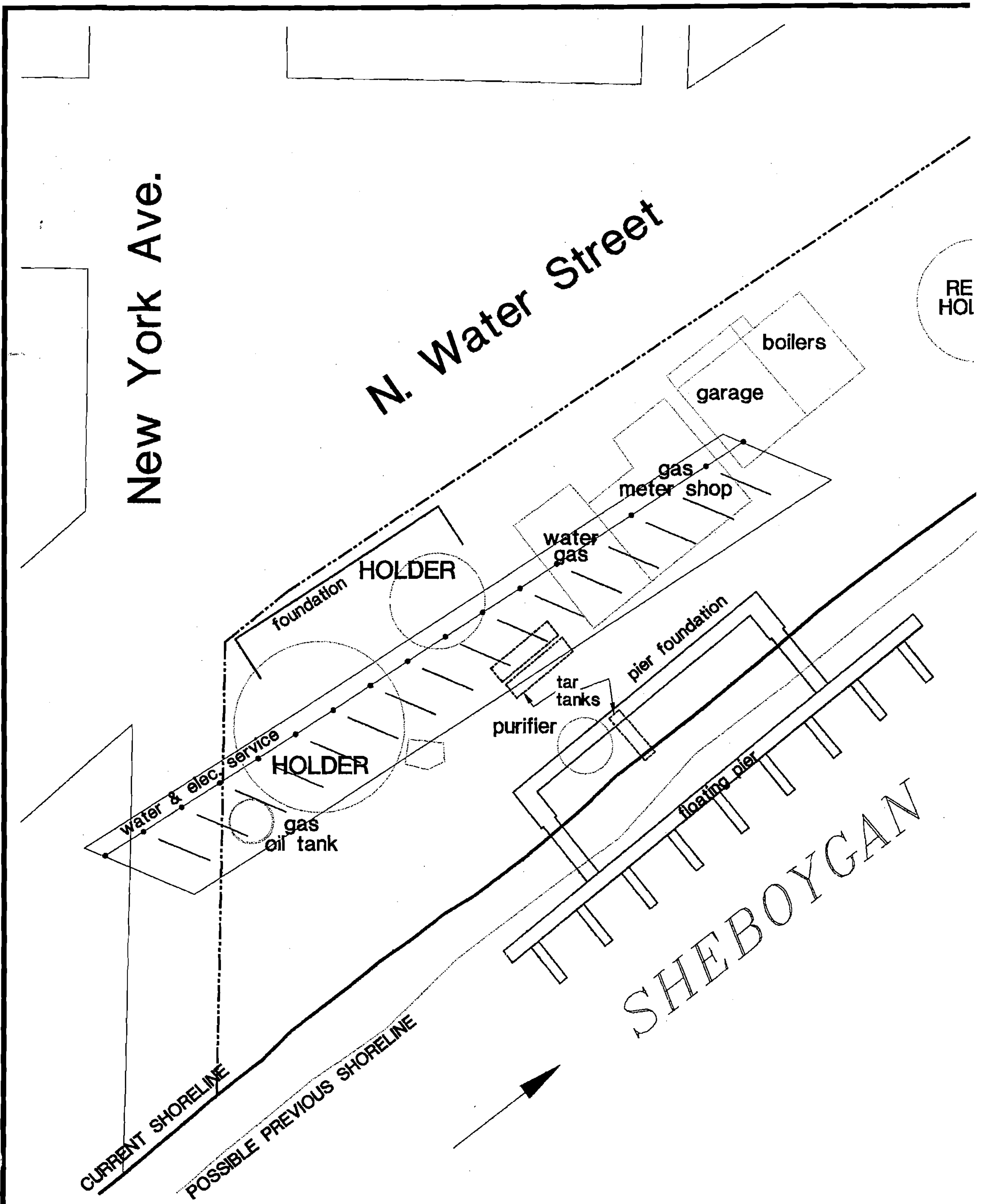
SITE LOCATION and LOCAL TOPOGRAPHY

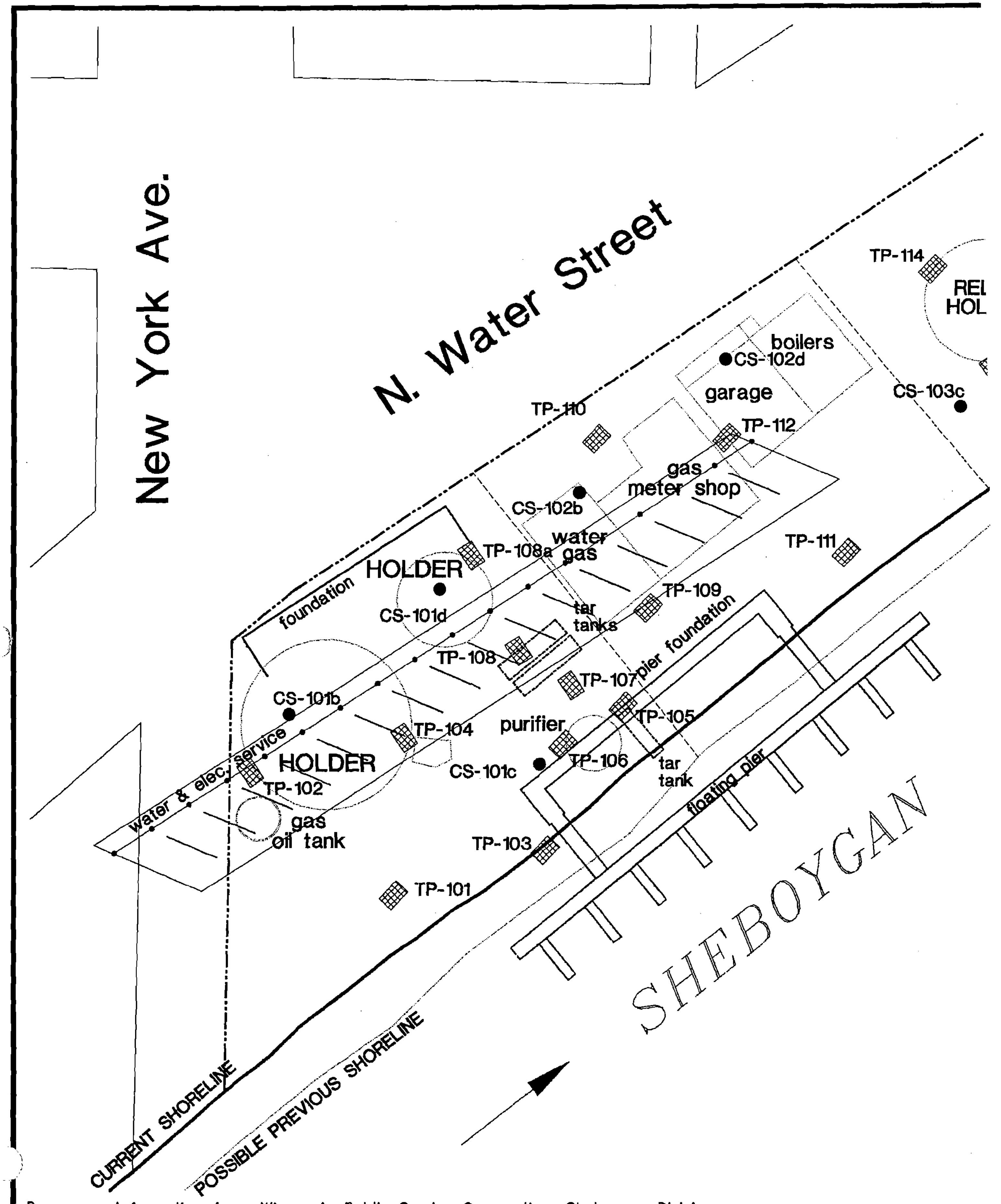
Dsgn. by:	Chk. by:	Apprv. by:
PROJECT: 453114843	DATE: 07/16/91	

DRAWING NO.: 1484-4

FIGURE: 2-1



Base map information from Wisconsin Public Service Corporation, Sheboygan Division,
Plan of Gas Works Property, Sheboygan, WI, 7/31/23, revised 12/04/24 and 10/06/41.



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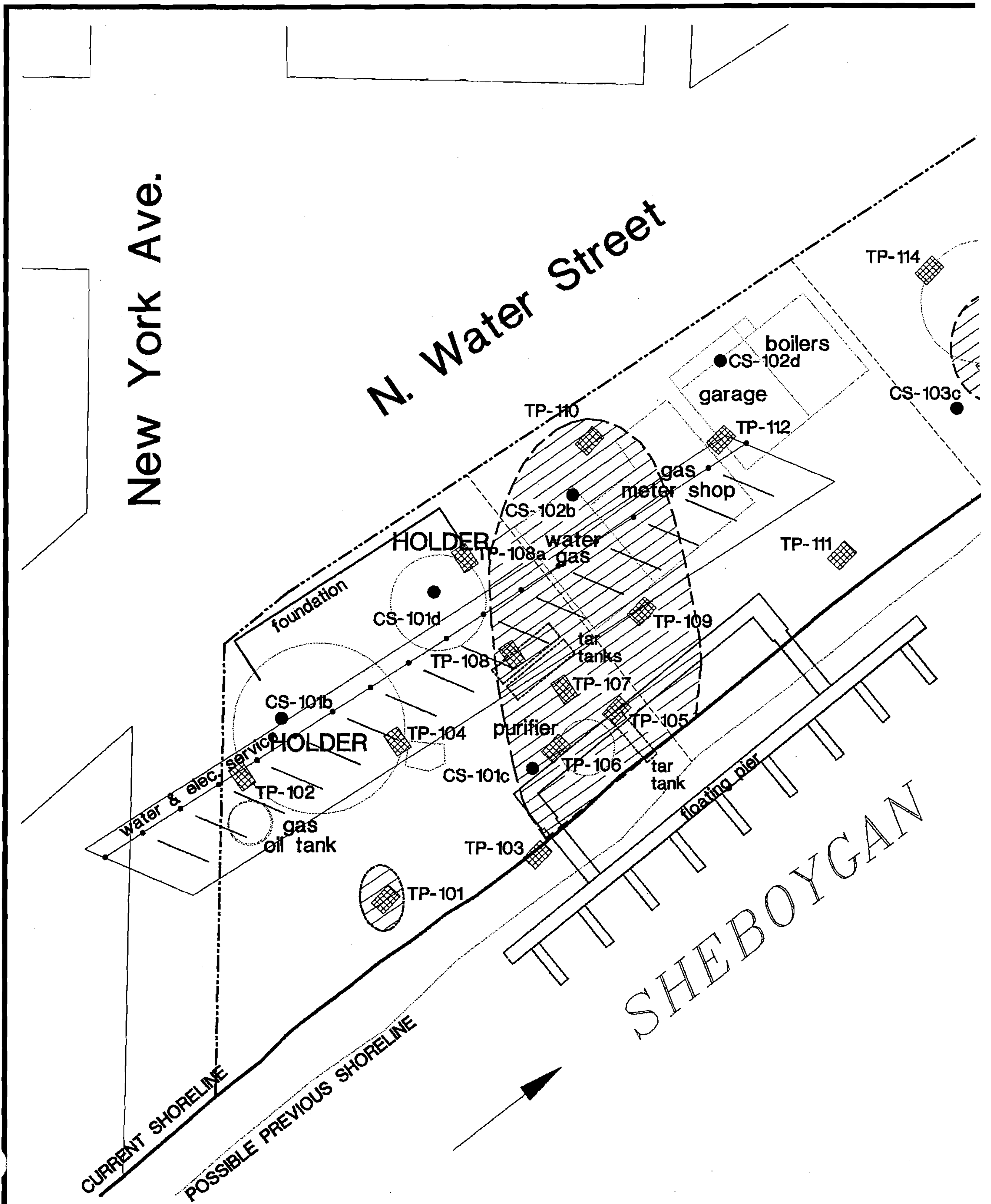

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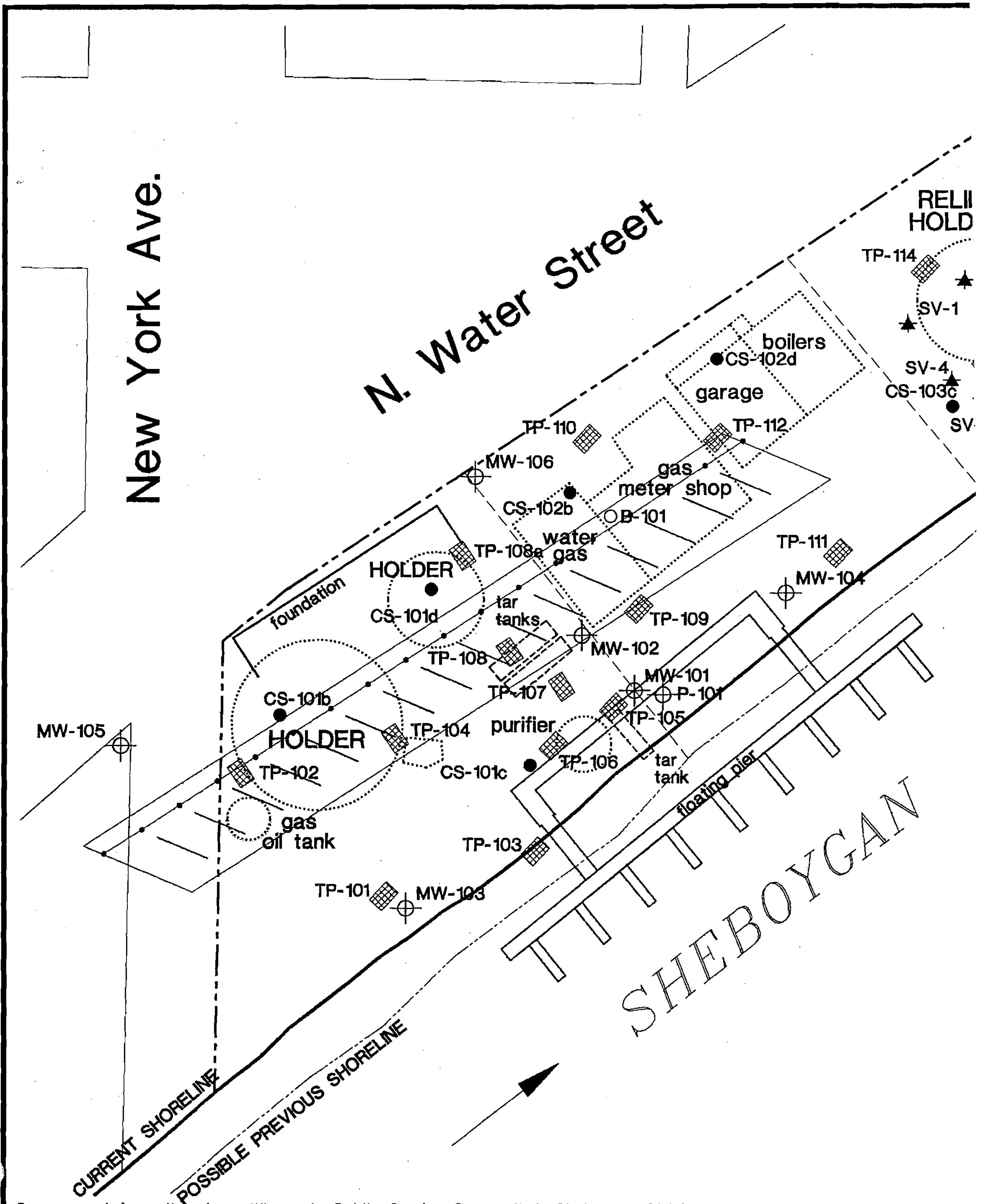

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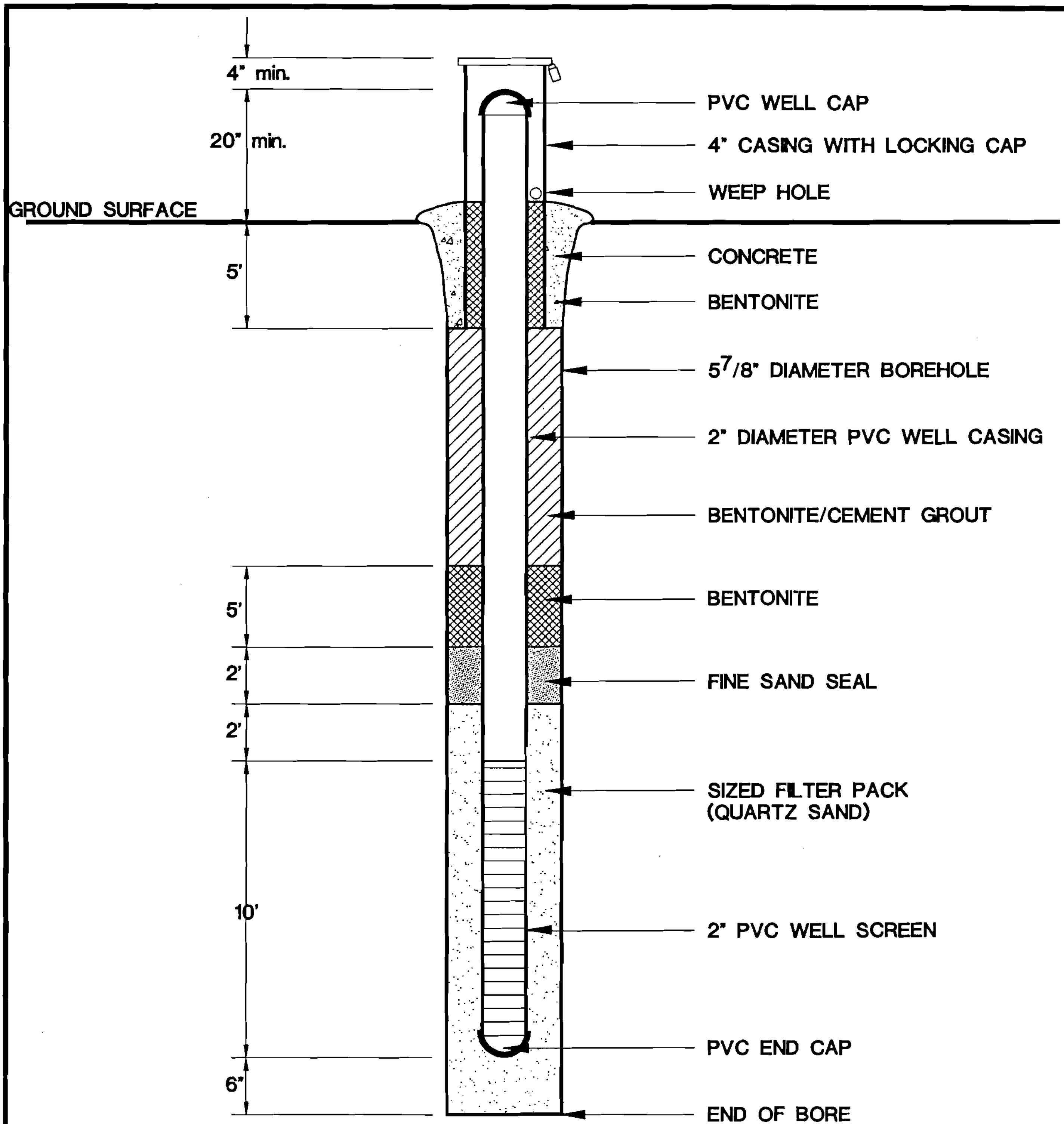

NOT TO SCALE

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TYPICAL WATER TABLE MONITOR WELL COMPLETION

Dsgn. by:	Chk. by:	Apprv. by:
PROJECT: 304533034	DATE: 09/25/92	

DRAWING NO.: T-MW006

FIGURE: 4-2

WORK SCHEDULE

PROJECT: Remedial Investigation of MGP Plant Site
PREPARED BY: K.A. Ebbott, Simon Hydro-Search
PREPARED FOR: Wisconsin Public Service Corp.,Sheboygan, WI

TASK DESCRIPTION	Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16					
Mobilization		■	■																			
Soil Gas Probe Installation				■																		
Borehole, Monitor Well and Steam Gage Installation					■																	
Well Development Hydraulic Testing and Surveying						■																
Ground-Water Sampling; Round I						■																
Ground-Water Sampling; Round II										■												
Data Analysis						■	■	■	■	■	■	■	■	■	■	■						
Report Preparation													■	■	■	■						

COMMENTS:

Figure 5-1

Table 4-1. Analytical Parameters, Methods of Analysis, and Detection Limits

Parameter	Analytical Method	Anticipated Detection Limit[+]	Number and Location of Samples
Soil Samples:			
BETX	USEPA 8020	100 µg/kg	11, Soil Borings
PAHs	USEPA 8270	660 µg/kg	11, Soil Borings
BTUs	ASTM	NA	3, Tar Saturated Soils
Ground-Water Samples:			
BETX	USEPA 8021	1.0 µg/L	22, Ground Water from All Monitor Wells, 2 Sample Events
PAHs	USEPA 8310 or 610 HPLC	0.02 to 0.5 µg/L	22, Ground Water from All Monitor Wells, 2 Sample Events
Total CN	USEPA 335.1	5.0 µg/L	22, Ground Water from All Monitor Wells, 2 Sample Events
Amenable CN	USEPA 335.2	5.0 µg/L	22, Ground Water from All Monitor Wells, 2 Sample Events
Weak Acid Dissociable CN	412-H	5.0 µg/L	22, Ground Water from All Monitor Wells, 2 Sample Events
pH	USEPA 150.1	0.01 s.u.	2, Ground Water probably from MW-101 and MW-107
TOC	USEPA 415.1	1.0 mg/L	2, Ground Water probably from MW-101 and MW-107
COD	USEPA 410.1	1.0 mg/L	2, Ground Water probably from MW-101 and MW-107
Oil and Grease	USEPA 413.1	1.0 mg/L	2, Ground Water probably from MW-101 and MW-107
Chloride	USEPA 325.3	1.0 mg/L	2, Ground Water probably from MW-101 and MW-107
TSS	USEPA 160.2	5.0 mg/L	2, Ground Water probably from MW-101 and MW-107
LNAPL Samples:			
IR Analysis	Freon Extraction, IR Analysis	NA	1, Floating Free Product

[+] Detection limit may vary due to dilution factors and other laboratory factors.

APPENDIX A

SIMON HYDRO-SEARCH

QUALITY ASSURANCE / QUALITY CONTROL PLAN

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QA-8 Analytical Methods or Characterization Tests for Other Parameters

QUALITY ASSURANCE / QUALITY CONTROL PLAN

The overall objective of the program is to perform an environmental investigation to assess the potential for an impact to human safety, health or the environment. The program will consist of site assessments, risk assessments and evaluation of remedial actions, as appropriate. The program will utilize the WDNR guidance for the investigation and clean-up of former coal gas plant sites, WDNR guidance for conducting environmental response actions, and the Gas Research Institute Management of Manufactured Gas Plant Sites Guidance.

The goal of this Quality Assurance/Quality Control (QA/QC) Plan is to ensure that the data generated and used during the environmental investigations of the MGP sites are technically sound, statistically valid, and properly documented.

A site-specific work plan has been presented in previous sections for the environmental investigation.

QA.1 Sampling Procedures

The purpose of this section is to present general sampling procedures which may be employed during the site investigations.

QA.1.1 Decontamination

All material and equipment will arrive on-site in clean condition. All fluids generated during decontamination procedures will be disposed of in accordance with WDNR regulations. Recommended procedures for equipment decontamination, described in the subsections below, will be followed where applicable.

QA.1.1.1 Drilling, Soil Sampling, and Monitor Well Installation Equipment Decontamination

Prior to the start of drilling, all drill rods, augers, bits, and split-spoons will be steam-cleaned at an area set up on-site for this purpose. The decontamination will be performed by the drilling subcontractor to the satisfaction of the site geologist and will be documented in the field notebook.

Augers, tools, drill rods, casings, and screens will be inspected to ensure that residue such as muds and machine oils are removed. These decontamination procedures will also be employed between each boring, if necessary, to prevent cross-contamination and ensure that integrity of soil samples. All equipment will also be decontaminated prior to removal from a site.

QA.1.1.2 Sampling Equipment Decontamination

The procedure for decontaminating sampling equipment is as follows:

1. Place dirty equipment on a plastic ground sheet or bucket at the head of the "decontamination line".
2. Rinse equipment in a tub of potable water to remove surface dirt and mud, if necessary.
3. Scrub equipment with a bristle brush in a basin filled with laboratory-grade detergent and potable water.
4. Rinse off soap in a tub of potable water.
5. Triple rinse with distilled water.

6. Wrap equipment in plastic or aluminum foil to protect from contamination, where appropriate.

QA.1.2 Sample Container and Preservation Requirements

All samples submitted for analysis on this project will be collected by Simon Hydro-Search personnel. Sampling containers and preservatives will be provided upon request by the analytical laboratory. The general requirements for sample containers, preservatives, and analytical holding times are discussed in the following subsections.

All containers provided by the laboratory will be obtained from I-Chem, Hayward, California, or be of equivalent quality. I-Chem is the bottle contractor to the EPA CLP. All containers are cleaned in accordance with EPA protocols. Each lot of these containers will be analyzed in accordance with I-Chem quality control requirements and is not shipped by I-Chem unless the QC requirements are met. The types of containers that will be provided for each analyte are listed in Table QA-1, along with the holding times and preservatives required for each analysis.

All sample containers provided by the laboratory will be shipped with chain-of-custody records. These chain-of-custody records will be compiled by the field sampling personnel and returned with the samples.

QA.1.3 Sample Identification and Documentation

Each sample container will be labeled with the following information:

- Sample identification code
- Date/time of collection
- Preservative
- Analysis requested

- Any special information, including potential level of contamination

The sample identification code is an alpha-numeric code used to specify the material type, location, and sampling interval (i.e., depth), where appropriate, for each sample. For example; SB110-3 to 5 refers to a soil sample from borehole location 110 over the 3- to 5-foot depth interval; and MW-203 refers to a ground-water sample from monitor well location 203.

Listed below are the standard codes to identify the type of material to be sampled. To an extent, these codes also identify the sampling location.

- B = Soil borehole
- MW = Monitor well (soils and ground-water)
- ST = Trench or test pit soil
- SS = Surficial soil
- SW = Surface water
- SD = Sediment
- HC = Free hydrocarbons
- BX = Oxide box wastes

If a sample is a composite, the letter "C" will follow the depth intervals over which the composite was collected. An appropriate description of the sample will be recorded on the chain-of-custody record and field notebook.

QA.1.4 Sample Packaging and Shipment

It is anticipated most samples will be delivered to the analytical laboratory by Simon Hydro-Search personnel. If samples are shipped, the sample packaging procedures will comply with all U.S. Department of Transportation requirements for shipment of environmental samples as follows:

- The lid of each labeled container will be secured with a strip of custody tape.

- Individual sample containers will then be sealed in "Ziploc" plastic bags and placed in coolers.

- Vermiculite will be placed around the bags in the cooler. Ice will be placed in the cooler.

- One chain-of-custody form will be completed for each cooler, placed in a large "Ziploc" bag, and taped to the inside lid of the cooler.

- The following labels will be placed on the cooler.

    - Upward-pointing arrow labels on all four sides.
    - "This End Up" on top.

QA.2 Sample Custody Procedures

QA.2.1 Introduction

Sample custody protocols will be based on procedures as described in "NEIC Policies and Procedures", EPA-330/9-78-DD1-R, Revised June, 1985. This custody is in two parts: sample collection and laboratory analysis. A sample is under a person's custody if it meets the following requirement:

- It is in the person's possession,
- It is in the person's view, after being in the person's possession,
- It was in the person's possession and it was placed in a secured location, or
- It is in a designated secure area.

QA.2.2 Field Specific Custody Procedures

The sample packaging and shipment procedures summarized below will assure that the samples will arrive at the laboratory with the chain-of-custody intact.

Field Procedures are as follows:

a) The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched. As few people as possible should handle the samples.

b) All bottles will be tagged with sample numbers and locations. The sample number will be affixed as described in Section QA.1.3.

c) Sample tags will be filled out using waterproof ink for each sample.

d) The Project Manager must review all field activities to determine whether proper custody procedures were followed during the field work and decide if additional samples are required.

Transfer of Custody and Shipment Procedures are as follows:

a) Samples are accompanied by a properly completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage area.

b) Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and secured with strapping tape in at least two locations for shipment to the laboratory.

c) Whenever samples are split with a source or government agency, a separate Sample Receipt is prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the facility or agency should request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, this is noted in the "Received By" space.

d) All shipments will be accompanied by the Chain-of-Custody Record identifying the contents. The original record will accompany the shipment, and the pink and yellow copies will be retained by the sampler for returning to the sample office.

e) If the samples are sent by common carrier, a bill of lading should be used. Receipts of bills of lading will be retained as part of the permanent documentation. If sent by mail, the package will be registered with return receipt requested. Commercial carriers are not required to sign off on the custody form as long as the custody forms are sealed inside the sample cooler.

QA.2.3 Laboratory Custody Procedures

Standard CLP laboratory or equivalent chain-of-custody procedures and sample tracking procedures will be performed.

QA.3. Calibration Procedures and Frequency

As an activity that affects data quality, field and laboratory instrument calibration must be performed in accordance with formal written procedures as required in this section. Laboratory calibration procedures and frequencies will be in accordance with the CLP guidance or the EPA methods employed, when CLP guidance is not available for the selected parameter.

Simon Hydro-Search further requires that field instruments be calibrated and maintained to operate within manufacturer's specifications by trained personnel.

Several field instruments are anticipated to be used during this project. Proper calibration and use of these instruments is essential in providing accurate measurements. Calibration and measurement procedures for these instruments are described in the sections below. All calibration performed in the field will be documented in the field log book and on appropriate forms.

A master calibration/maintenance file will be maintained by the Site Investigation Task Coordinator for each measuring device and will include at least the following information:

- Name of device and/or instrument calibrated
- Device/instrument serial and/or I.D. number
- Date/Time of calibration
- Results of calibration
- Name of person performing the calibration
- Identification of the calibration media/method (e.g., HNu gas, pH buffer solutions)

QA.3.1 HNu PID

The HNu is a portable, non-specific vapor/gas detector employing the principle of photoionization to detect a variety of volatile compounds, both organic and inorganic. HNu readings are routinely performed during borehole installations in areas of known or suspected contamination and as part of soil surveys to define extent of contamination. The instrument is also frequently used to monitor ambient air for health and safety purposes.

The HNu contains an ultraviolet (UV) light source within its sensor chamber. Air is drawn into the chamber with the aid of a small fan. If the ionization potential (IP) of any molecule present in the air is equal to or lower than the energy of the UV light source, ionization will take place, causing a deflection in the meter. Response time is approximately 90% at 3 seconds. The meter reading is expressed in ppm as benzene equivalents. Compounds other than benzene may produce instrument responses with higher or lower sensitivity relative to benzene.

The HNu is used as a field screening and semi-quantitative field measurement device to monitor photoionizable volatile organic compounds (VOCs) in air. Field screening of potential soil or ground-water contamination is accomplished by performing a headspace analysis on air in contact with a sample within an enclosed container. The form used for recording PID readings is shown in Appendix B.

Limitations to the use of the HNu include the following:

- The HNu cannot identify the compounds being detected.
- If the IP of a compound is greater than the UV light source, the instrument will not respond.
- The HNu will not detect methane gas.

- During cold weather, condensation may form on UV light source window, producing erroneous meter response.

- Instrument readings can be affected by humidity and power lines.

- Concentrations are measured relative to benzene. Therefore, actual contaminant concentrations in the air sample cannot be quantified, unless the contaminant occurs as a single compound whose sensitivity is known relative to benzene. While the instrument scale reads 0 to 2,000 ppm, response is linear (to benzene) only from 0 to about 600 ppm. Concentrations greater than 600 ppm may be "read" at a higher or lower level than the true value.

- Wind speeds greater than 3 miles an hour may affect fan speed and readings, depending on the position of the probe relative to the wind direction.

QA.3.1.1 Calibration Procedure

Prior to use, the battery will be rested by turning the function knob to "BATT" and confirming needle deflection to the green zone of the meter scale.

The instrument will be zeroed by rotating the zero potentiometer knob when the function switch is in the "Stand-by" position. Instrument function will be verified by placing the probe near an organic point source, such as a magic marker, and noting meter deflection.

The HNu PID will be calibrated per the WDNR recommended frequency as described below:

1. just prior to use, each day of use;
2. at a minimum of 5 hours of use;

3. after any significant change in humidity or temperature (more than 15°F) from the latest calibration;
4. every 3 hours if an 11.7 eV lamp is used; and
5. after any repairs to the instrument were performed.

HNu calibration gas canisters equipped with a regulator will be used to calibrate the instrument. The calibration procedure is as follows:

1. Connect a sampling hose fitted with a "t" piece to the regulator outlet on the span gas cylinder. Correct the sampling probe of the HNu to the perpendicular portion of the "t" piece, allowing the gas from the canister to follow the straight line flow path.

2. Open the regulator valve until gas can be heard flowing from the canister.

3. Take a reading after 5 to 10 seconds.

4. Adjust the span potentiometer to produce the concentration listed on the calibration gas cylinder.

5. If the span potentiometer setting cannot be lowered sufficiently to register the calibration gas concentration, the instrument must be cleaned or returned for maintenance and recalibration.

6. Calibration results will be documented each day on the HNu calibration log. This documentation includes recording the following:

    a) Date inspected,
    b) Person who calibrated the instrument,
    c) The instruments I.D. number,

d) The results of the calibration (ppm, probe eV, span potentiometer setting), and

e) Identification of the calibration gas (source, type, concentration pressure).

A separate calibration log will be maintained for each HNu used.

QA.3.1.2 Measurement Procedure

Semi-quantitative measurements of total VOCs in soil and ground water can be determined using an HNu PID by monitoring the headspace within a sample jar. The procedure to be used for measuring sample headspace is as follows:

1. Record the background ambient air concentration using the HNu. Record the background reading on the PID form. Typical background values are 0 to 3.0 ppm or higher depending on the measurement location. If possible, locations with ambient PID readings greater than 3.0 ppm should not be utilized for field screening measurements.

2. Half-fill a clean 16 oz. glass Mason jar with the sample to be analyzed. Quickly cover the top with two sheets of clean aluminum foil and apply a screw cap to tightly seal the jar.

3. Allow headspace development of VOCs for 10 minutes in ambient temperature greater than 55 °F. If outdoor temperatures are below 55 °F, move the samples indoor or to a heated vehicle. Vigorously shake or swirl the jar for 15 seconds both at the beginning and end of the headspace development period.

4. Measure the headspace organic gas chemistry by quickly puncturing the foil seal with the HNu sampling probe to a point about one-half of the headspace depth. Exercise care to avoid uptake of water droplets or soil particulates in the probe.

5. Record the maximum meter response observed within 15 seconds on the field PID data form. Maximum response should typically occur between 2 and 5 seconds. Erratic meter response may occur at high organic vapor concentrations or conditions of elevated headspace moisture, in which case notation should be made of the suspected cause of the erratic reading. Record sample identification information.

6. All HNu readings for soil will be followed by the symbol "d" (dry), "m" (moist) or "w" (wet) to aid in data interpretation. The symbol "w" will be used when there is substantial accumulation of water droplets in the bag or jar to the extent that readings are probably being affected by the humidity. Erratic meter response may occur at high organic vapor concentrations or conditions of elevated headspace moisture, in which case headspace data should be discounted.

QA.3.1.3 Quality Assurance

Replicates

If sufficient sample is available, headspace analysis of samples will be performed in duplicate. If duplicate samples are collected, the headspace screening data from both jar samples should be recorded and averaged. Generally, replicate values should be consistent to ±20%.

Blanks

Blank samples will be measured to determine if any contamination is being introduced as part of the measurement procedure. One PID blank sample will be performed for each 11 samples measured, which represents one jar for each case of Mason jars used. The measurement procedure for field PID blanks is given below.

Water

Substitute distilled water for sample water, and follow the same headspace measurement procedure as outlined previously.

Soil

The headspace measurement procedure outlined previously will be followed, but no sample will be placed in the Mason jar, as no universal soil blank has been accepted. A headspace reading of the jar should be taken after the jar has been opened, resealed, and allowed to sit for 10 minutes.

QA.3.1.4 Data Recording

PID data will be recorded in the field notebook or on applicable field forms and clearly marked "PID reading (ppm)". In addition to data records, maintenance records and calibration records will be generated and maintained on appropriate forms or in the site field notebook. Records of instrument user dates of uses, instrument identification number, and project identification will also be maintained.

QA.3.2 pH Meter

The pH meter is used to determine the negative log of the hydrogen ion activity concentration within a solution, measuring its acidity or alkalinity. Field pH measurements will be performed on water samples during well development and purging prior to sampling. Soil pH values are determined in the laboratory. The units measured are standard units, and fall on a scale of 1 to 14, with a neutral value of 7, acidic values below 7, and alkaline values above 7. The accuracy of most field pH meters is ±0.15 SU.

QA.3.2.1 Calibration Procedure

Simon Hydro-Search typically utilizes a Cole Parmer digital pH meter. Buffer solutions must be fresh within the expiration date and they must be kept clean.

1. Connect electrode to control box and rinse electrode with distilled water.
2. Dry electrode and repeat distilled water rinse.
3. Immerse electrode in pH 7 buffer. Buffer temperature should be approximately equivalent to the anticipated sample temperature.
4. Turn pH meter on, perform battery check. If battery is low, replace.
5. Swirl buffer and let reading stabilize 15 to 30 seconds.
6. Push the STAND key to allow the meter to internally calibrate to pH 7.0.
7. Remove electrode, rinse with distilled water, dry and rinse with distilled water again.

8. Immerse in second buffer, either pH 4.0 or 10.0 depending upon the estimated pH of the samples.

9. Swirl buffer and let reading stabilize for 15 to 30 seconds.

10. Push the SLOPE key to adjust meter to pH 4.0 or 10.0

11. Remove electrode, rinse with distilled water, and replace protective cap.

QA.3.2.2 Measurement Procedure

The procedure for use of the Cole Parmer digital pH meter is given below. The meter must be calibrated prior to use.

1. Hook electrode to control box.
2. Turn control box on.
3. Check battery level. If insufficient, replace.
4. Pour solution to be measured in a clean plastic or glass beaker.
5. Remove protective cap from electrode, rinse with distilled water, and blot dry.
6. Immerse electrode in the sample and swirl the beaker for several seconds.
7. Allow meter to stabilize approximately 15 to 30 seconds.
8. Push MEASURE key and allow reading to stabilize.
9. Record reading.

QA.3.2.3 Quality Assurance

Replicates

For water-quality sampling, duplicate pH measurements will be made if the sampled water has a significantly different pH than values obtained previously from that location during development or purging. For well development and packer testing, frequent pH measurements are required; therefore no replicate measurements will be necessary.

Calibration Checks

Calibration will be performed prior to field measurements, and checked after every ten measurements using the pH 7, and pH 10, or 4 buffer solutions.

QA.3.2.4 Data Recording

Data from pH measurements will be recorded in the field notebook and/or appropriate field forms, including Well Development/Purge Summary forms and Water Quality Sampling and Analysis Forms (Appendix B). In addition to data measurements, calibration frequency and results will be recorded.

QA.3.3 Specific Conductance Meter

Specific conductance measurements are routinely performed during water-quality sampling and during well development to determine general water quality. Specific conductance is directly dependent upon the total ionic constituents in a solution. The specific conductance of the solution is measured by sending an electric charge between two sensors in the probe. The greater the concentration of ionic constituents in the sample, the greater the ability to transmit a charge, and the higher the measured conductivity.

The YSI Model 33 specific conductance meter (S-C-T meter) provides a semi-quantitative measurement of the total ionic content of water samples. Specific conductance is loosely related to the total dissolved solids because generally an increase in TDS causes an increase in the concentration of ionic species, which, in turn, directly affects the conductance of the solution. The readout unit is in micromhos/centimeter (μmhos/cm).

Specific conductance is temperature dependent, so a temperature measurement must be made at the time of the specific conductance measurement. A temperature compensation adjustment which has been established by the equipment manufacturer can then be made to allow comparison of conductivity values. Conductivity values are universally corrected to 25 ° C. According to the manufacturer, the obtained conductivity values are reportedly accurate to ±2.5%.

QA.3.3.1 Calibration Procedure

The calibration procedure is as follows:

1. Note if the needle on the unit display aligns with the "0" on the meter. If it does not, use a screwdriver and adjust the needle to "0" by turning the screw located directly below the words "S-C-T meter" on the unit display.

2. Plug probe into the probe jack on the side of control box.

3. Turn mode switch to "RED LINE".

4. Adjust needle using the knob labeled "RED LINE" until the needle covers the red line on the meter display.

5. If the unit will not red line, replace batteries, or try to diagnose the problem.

Calibration will be performed before every use.

QA.3.3.2 Measurement Procedure

1. Plug the probe into the probe jack on the control box.

2. Calibrate the unit as described previously.

3. Obtain a water sample in a 500-ml beaker or other container.

4. Immerse the probe in the solution. Make sure the probe is completely submerged by the sample liquid.

5. Immerse thermometer in the beaker.

6. Turn the MODE switch to the setting for which the instrument needle is on scale. The greatest accuracy is obtained when the needle records in the middle of the display.

7. Allow the reading to stabilize for approximately 15 to 20 seconds.

8. Read and record the measured conductivity. Use the black scale on top of the meter gauge. If MODE is set to the 10x or 100x scale, multiply value by 10 or 100. Readings are made by lining up the needle over the reflective mirror backing. Readings are in μmhos/cm.

9. Read and record the temperature of the sample using the thermometer. Compare thermometer value to the temperature mode on the conductivity meter.

10. Turn unit off and remove the thermometer from the sample.

11. Clean the conductivity meter electrode and the thermometer by rinsing with distilled water.

12. Adjust measured field conductivity value to the standard 25°C conductivity value.

QA.3.3.3 Quality Assurance

Replicates

For water-quality sampling, conductivity measurements will be made in duplicate if the observed conductivity value is significantly different form previously obtained values observed at that location during development or purging. For well development and packer testing, frequent conductivity measurements are made, and therefore no replicate measurements should be necessary.

Blanks

No blank measurements will be obtained.

QA.3.3.4 Data Recording

Specific conductance measurement data, including blank and replicate measurements will be recorded in the field notebook and/or on appropriate field forms, including Well Development/Purge Summary forms and Water Quality Sampling and Analysis forms (Appendix B). In addition to data reading, any maintenance or measurement problems noted during field work will be recorded.

QA.3.4 Alkalinity

Field alkalinity apparatus consists of a Hach Digital Titrator, associated titration solution buffers, and a pH meter. Alkalinity refers to the capability of water to neutralize acids.

Carbonates, bicarbonates, and hydroxides are the most common causes of alkalinity in natural waters. Alkalinity measurements are made during water-quality sampling.

QA.3.4.1 Measurements

Field alkalinity measurements are generally performed on water samples using the alkalinity titration kit. Data is measured in milligrams per liter (mg/l) of total alkalinity as $CaCO_3$.

QA.3.4.2 Measurement Procedure

1. Attach a clean, straight-stem delivery tube to a 1.600 N Sulfuric Acid Titration Cartridge. Twist cartridge on titrator body. For alkalinities below 100 mg/l as $CaCO_3$, use a 0.1600 N Sulfuric Acid Titration Cartridge and divide the final concentration by 10 to determine the mg/l alkalinity as $CaCO_3$.

2. Flush the delivery tube by turning the delivery knob to eject a few drops of titrant. Reset the counter to 0 and wipe the tip.

3. Collect at least 200 ml of sample in a clean polyethylene or glass container. If not analyzed immediately, samples may be stored at 4°C for up to 24 hours. Measure 100 ml of sample to be analyzed in a clean 100 ml graduated cylinder. Pour the sample into a clean 250 ml Erlenmeyer flask.

4. Insert calibrated pH meter in the sample.

5. Add 1.6 N Sulfuric Acid Titration Cartridge to the sample by slowly turning the titrator. Swirl the solution regularly and monitor the pH of the solution.

6. Continue the titration with 1.600 N Sulfuric Acid Titration Cartridge until the pH registers 4.5.

7. Read the concentration of total alkalinity from the digital counter window.

The relationship between carbonate, bicarbonate and hydroxide concentrations as a fraction of pH are well established. If necessary, the original pH of the sample can assist in the determination of which form of alkalinity is dominant in the sample.

QA.3.4.3 Quality Assurance

Duplicate alkalinity measurements will be performed if sufficient sample is available.

QA.4 Analytical Procedures

All analytical services will be provided by a state licensed laboratory. Analyses will subscribe, whenever possible, to the most current EPA CLP Statement of Work (SOW) for organic and inorganic analyses. Analytical methods for parameters not included in the CLP will be taken from Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020 and Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 (or where otherwise specified).

Tables QA-2 through QA-8 presents parameters of interest, the detection limits for each media and the methodology which may be employed in lieu of CLP methodology.

Four analytical methods are included for the analysis of PAH compounds. These methods vary in their detection limits and costs of analysis. Guidance regarding the selection of the specific PAH analytical method of a particular sample is as follows:

- GC/MS method 8310 - Achieves the lowest possible quantification limits and will be utilized for all PAH analysis of surface and ground water due to the low solubility of the compounds of interest. Method 8310 will also be used for soil samples where data is likely to be used to establish exposure levels for risk assessment.

- GC/MS method 8270 - Detection Limits are higher than for method 8310, but offers significantly reduced cost. Method 8270 is appropriate where identification and quantification of PAH compounds is required for soil samples known to be impacted based on field observation of odor or staining.

QA.5 Laboratory Quality Control Determination

The reliability and credibility of analytical laboratory results is established by quality control samples such as the inclusion of randomly scheduled replicate analyses, analysis of standard spiked samples, and the analysis of split samples.

Field QA/QC samples will consist of field replicates, field blank and trip blank samples. Trip blank samples will be analyzed for BETX. Replicates will be collected at a minimum frequency of one per every ten or fewer water samples collected. The replicates or duplicates will be analyzed for the same parameters as those analyzed in the samples of the media and will be used to assess sampling precision.

A field blank consists of a group of sample containers filled with analyte-free water in the same manner as investigative samples. The containers are transported empty into the field and are used in collecting "rinse water" obtained after decontamination between samples by pouring analyte-free water over the equipment used to receive the various types of samples. Field blanks will be analyzed for the same parameters as the investigative samples and will be obtained in the same manner as all other samples. One field blank will be collected at a frequency of one per ten or fewer investigative samples and will serve to monitor potential field ambient contamination and cross-contamination from sampling equipment. Although dedicated bailing equipment will be used for ground-water sampling, ground-water field blanks will still be obtained to evaluate the potential for sample carryover between sample events.

Trip blanks will be provided daily by the laboratory and will consists of two 40-ml vials containing deionized water. The trip blanks to be analyzed for BETX will be handled and transported in the same manner as field samples. One set of trip blanks will be in each cooler containing BETX samples and will serve to monitor potential cross-contamination due to migration of BETX across septa.

Standard analytical quality control checks will be instituted by laboratory personnel which may include, but are not limited to, matrix spike/matrix spike duplicate analyses and surrogate spike analyses.

QA.6 Data Management

QA.6.1 Field and Technical Data

The field and technical (non-laboratory) data that will be collected can generally be characterized as either "objective" or "subjective" data.

Objective data include all direct measurements of field data such as field screening/analytical parameters and water level measurements. Subjective data include descriptions and observations. Soil borings and well logs include both subjective and objective data in that the data recorded in the field are descriptive but can be reduced using a standardized lithologic coding system.

QA.6.1.1 Field Logs

All data collection activities performed at a site will be documented either in a field notebook or on appropriate forms. Entries will be as detailed and descriptive as possible so that a particular situation can be recalled without reliance on the collector's memory. All field log entries will be dated. All field log forms will be kept in ring binders assigned to individual field personnel.

The cover of each notebook or ring binder will contain the following information:

- Project name
- Start date

QA.6.1.2 Data Reduction

As previously described, all field data will be recorded by field personnel in field notebooks and/or on the appropriate forms in ring binders. Upon completion of each test boring or monitor well, a form will be completed that will include lithologic codes along with descriptive data.

After checking the data in the field notes and forms, the data will be reduced to tabular form, wherever necessary, by entering it in data files. Subjective data will be filed as hard copies for later review and for incorporation into technical reports as appropriate.

QA.6.1.3 Data Validation

Validation of objective field and technical data will be performed at two different levels. On the first level, data will be validated at the time of collection by following standard procedure QC checks. At the second level, data will be validated by field personnel and/or the project manager who will review it to ensure that the correct codes and units have been included.

After data reduction into tables or arrays, the data sets will be reviewed for anomalous values. Any discovered inconsistencies or anomalies will be resolved immediately, if possible, by seeking clarification from the field personnel responsible for collecting data.

Subjective field and technical data will be validated by the Project Manger, who will review field reports for reasonableness and completeness. Whenever possible, peer review will also be incorporated into the data validation process, particularly for subjective data, in order to maximize consistency between field personnel.

APPENDIX A - TABLES

Table QA-1

SAMPLE CONTAINERS, SAMPLE VOLUMES, PRESERVATION, AND HOLDING TIMES

Aqueous Samples			
Analyte	Container Volume	Preservation	Maximum Holding Time[1]
Volatile Organics	3 X 40 ml Vials	2 Drops of 1:1 HCl, Cool to 4°C	14 Days
Semivolatile Organics	2 X 1-Liter Glass	Cool, 4°C	7/40[2] Days
Cyanide	1-Liter Plastic	Sodium Hydroxide to pH $\geq$12, 0.6g ascorbic acid, cool to 4°C	14 Days
COD	1-50 ml Glass[4]	H_2SO_4 to pH <2 Cool to 4°C	28 Days
BOD	1-100 ml Glass[4]	Cool to 4°C	48 Hours
TOC	1-50 ml Glass[4]	H_2SO_4 to pH <2 Cool to 4°C	28 Days
Oil & Grease	1-Liter Glass[4]	H_2SO_4 to pH <2 Cool to 4°C	28 Days
Sulfide	1-500 ml Glass[4]	2 ml Zinc Acetate NaOH to pH >9 Cool to 4°C	7 Days
Sulfate	1-100 ml Glass[4]	Cool to 4°C	28 Days
Nitrate	1-100 ml Glass[4]	Cool to 4°C	48 Hours
Ammonia	1-400 ml Glass[4]	H_2SO_4 to pH <2 Cool to 4°C	28 Days
Phosphate	1-100 ml Glass[4]	Cool to 4°C	48 Hours
Chloride	1-100 ml Glass[4]	Cool to 4°C	28 Days

Table QA-1 (Cont'd.)

SAMPLE CONTAINERS, SAMPLE VOLUMES, PRESERVATION, AND HOLDING TIMES (CONT'D.)

Soil and Semi-Solid Media

Analyte	Container Volume	Preservation	Maximum Holding Time[1]
Volatile Organics	2 X 40 ml Vials	Cool to 4°C	14 Days
Semivolatile Organics	1-Liter Glass	Cool, 4°C	7/40[2] Days
Metals	1-Liter Glass	Cool, 4°C	180 Days[3]
Inorganic and Physical	1-Liter Glass	Cool, 4°C	14 Days

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[1] This is the maximum holding time from date of collection.
[2] Extraction within 7 days, analyses within 40 days of extraction.
[3] Mercury holding time is 28 days from date of collection.
[4] These containers can be plastic or glass.

Table QA-2

DETECTION LIMITS AND ANALYTICAL METHODS FOR SELECTED INORGANIC CHEMICALS

Chemical	Analytical Methods Water(a)	 Solids(b)	Detection Limits Water(ug/l)	 Solids(mg/kg)
Inorganic Nitrogen				
Ammonia	350.1	—	1000	—
Nitrate	353.2	353.2 (c)	50	50
Inorganic Sulfur				
Sulfides	376.1	—	1000	—
Thiocyanates	412.L (d)	—	1000	—
Sulfate	375.2	—	20000	—
Inorganic Phosphorus				
Phosphate (e)	365.2	365.2	50	10
Inorganic Chlorides				
Chloride	325.3	—	500	—
Inorganic Cyanides				
Total Cyanide	335.2	9010	10	.10
Cyanide Amenable To Chlorination	335.1	9010	10	.10

(a) Reference: *Methods For Chemical Analysis of Water and Wastes*, U.S. EPA, 1983.

(b) Reference: *Test Methods In Evaluating Solid Waste, Physical/Chemical Methods*, U.S. EPA, 1986.

(c) The EPA Method for water is readily adapted to solid samples by adding the solid material to deionized water and proceeding with the method.

(d) There is no EPA method. This method is from *Standard Methods for Examination of Water and Wastewater*, 16th edition.

(e) Orthophosphate

NA = EPA approved analytical technique is not available.

Table QA-3

DETECTION LIMITS AND ANALYTICAL METHODS
FOR SELECTED METALS

Chemical	Analytical Methods		Detection Limits	
	Water(a)	Solids(b)	Water(ug/l)	Solids(mg/kg)
Arsenic (c)	206.2	7060	1	0.05
Barium (c)	200.7	6010	5	0.2
Cadmium (c)	213.2	6010	0.2	0.5
Calcium	200.7	6010	1000	50
Chromium (c)	218.2	6010	1	1
Copper	220.2	6010	1	1
Iron (c)	200.7	6010	20	1
Lead (c)	239.2	6010	1	2
Magnesium	200.7	6010	100	5
Manganese	200.7	6010	20	1
Mercury (c)	245.1	7471	0.2	0.01
Nickel	249.1	6010	20	1
Selenium (c)	270.2	7740	2	0.1
Silver (c)	272.2	6010	0.2	1

(a) Reference: Methods For Chemical Analysis of Water and Wastes, U.S. EPA, 1983.

(b) Reference: Test Methods In Evaluating Solid Waste, Physical/Chemical Methods, U.S. EPA, 1986.

(c) EP TOX Test.

Table QA-4

DETECTION LIMITS AND ANALYTICAL METHODS OF ANALYSIS FOR AROMATICS: GC METHOD 602 (WATER)(a) AND METHOD 8020 (SOLIDS)(b)

Compound	Detection Limits	
	Water(ug/l)	Solids(ug/kg)
Benzene	1	10
Toluene	1	10
Ethyl Benzene	1	10
Total Xylenes	1	10

(a) Reference: Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, U.S. EPA, 1982

(b) Reference: Test Methods In Evaluating Solid Waste, Physical/Chemical Methods, U.S. EPA, 1986.

Note: Specific detection limits are highly matrix-dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.

Table QA-5

DETECTION LIMITS AND ANALYTICAL METHODS OF ANALYSIS FOR PHENOLICS: GC METHOD 625 (WATER)[a] AND METHOD 8040 (SOLIDS)[b]

	Detection Limits	
Compound	Water(ug/l)	Solids(ug/kg)
Phenol	5	500
2-Chlorophenol	5	500
2-Methylphenol	NA	NA
4-Methylphenol	NA	NA
2-Nitrophenol	10	1000
2,4-Dimethylphenol	5	500
2,4-Dichlorophenol	5	500
4-Chloro-3-Methylphenol	5	500
2,4,6-Trichlorophenol	5	500
2,4,5-Trichlorophenol	NA	NA
2,4-Dinitrophenol	20	2000
4-Nitrophenol	10	1000
4,6 Dinitro-2-Methylphenol	20	2000
Pentachlorophenol	10	1000

NA = Not Available

(a) Reference: Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, U.S. EPA, 1982

(b) Reference: Test Methods In Evaluating Solid Waste, Physical/Chemical Methods, U.S. EPA, 1986.

Note: Specific detection limits are highly matrix-dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.

Table QA-6

DETECTION LIMITS FOR ANALYSIS OF PAHS:

EPA GC/MS METHOD 8270

Compound	Detection Limits	
	Water(ug/l)	Solids(ug/kg)
Naphthalene	10	660
Acenaphthylene	10	660
Acenaphthene	10	660
Fluorene	10	660
Phenanthrene	10	660
Anthracene	10	660
Fluoranthene	10	660
Pyrene	10	660
Benzo(a)anthracene	200	1300
Chrysene	10	660
Benzo(b)fluoranthene	10	660
Benzo(k)fluoranthene	10	660
Benzo(a)pyrene	10	660
Indeno(1,2,3-cd)Pyrene	10	660
Dibenzo(a,h)anthracene	10	660
Benzo(g,h,i)perylene	10	660
2-Methylnaphthalene	10	660

Reference: Test Methods In Evaluating Solid Waste, Physical/Chemical Methods, U.S. EPA, 1986.

Note: Specific detection limits are highly matrix-dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, will be higher.

Table QA-7

DETECTION LIMITS FOR ANALYSIS OF PAHs BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY EPA METHOD 8310

Compound	Method Detection Limit (ug/l) UV	Method Detection Limit (ug/l) Fluorescence
Naphthalene	1.8	
Acenaphthylene	2.3	
Acenaphthene	1.8	
Fluorene	0.21	
Phenanthrene		0.64
Anthracene		0.66
Fluoranthene		0.21
Pyrene		0.27
Benzo(a)anthracene		0.013
Chrysene		0.15
Benzo(b)fluoranthene		0.018
Benzo(k)fluoranthene		0.017
Benzo(a)pyrene		0.023
Dibenzo(a,h)anthracene		0.030
Benzo(ghi)perylene		0.076
Indeno(1,2,3-cd)pyrene		0.043

Note: HPLC conditions: Reverse phase HC-ODS Sil-X, 5 micron particle size, in a 250 mm x 2.6 mm I.D. stainless steel column. Isocratic elution for 5 minutes using acetonitrile/water (4:6)(v/v), then linear gradient elution to 100% acetonitrile over 25 minutes at 0.5 mL/min. flow rate. If columns having other internal diameters are used, the flow rate should be adjusted to maintain a linear velocity of 2 mm/sec.

* * * * * * * * *

DETERMINATION OF PRACTICAL QUANTIFICATION LIMITS (PQL) FOR VARIOUS MATRICES*

Matrix	Factor**
Ground water	10
Low-level soil by sonication with GPC clean up	670
High-Level soil and sludges by sonication	10,000
Non-water miscible waste	100,000

Note: * Sample PQLs are highly matrix-dependent. The PQLs listed herein are provided for guidance and may not always be achievable.

** PQL = (Method Detection Limit) x (Factor). For non-aqueous samples, the factor is on a wet-weight basis.

Table QA-8

ANALYTICAL METHODS OR CHARACTERIZATION TESTS FOR OTHER PARAMETERS

Parameter/Characteristic	Method	Reference
WATER		
pH	EPA 150.1	EPA, 1983
Chemical Oxygen Demand	EPA 410.1	EPA, 1983
Biochemical Oxygen Demand	EPA 405.1	EPA, 1983
Total Organic Carbon	EPA 415.1	EPA, 1983
Oil and Grease	EPA 413.1	EPA, 1983
Microbial Count (Total and PAH Degraders)	---	Clark; Shiaris & Cooney(a)
HYDROCARBON		
Viscosity	ASTM D445	ASTM Methods
Heat Content (Btu)	---	ASTM Methods
Ash Content	EPA 160	EPA, 1983
Chloride Content	EPA 325.3	EPA, 1983
Paint Filter Test	EPA 9095	EPA, 1986
EP Toxicity Test	40 CFR 261.24	Code of Federal Regulations
RCRA Reactivity Test	40 CFR 261.23	Code of Federal Regulations
OXIDE BOX WASTE		
pH	EPA 9045	EPA, 1986
EP Toxicity Test	40 CFR 261.24	Code of Federal Regulations
RCRA Reactivity Test	40 CFR 261.23	Code of Federal Regulations
SOIL		
pH	EPA 9045	EPA, 1986
Total Organic Carbon	EPA 9060	EPA, 1986
Microbial Count (Total and PAH Degraders)	---	Clark; Shiaris & Cooney
EP Toxicity Test	40 CFR 261.24	Code of Federal Regulations
RCRA Reactivity Test	40 CFR 261.23	Code of Federal Regulations
Grain Size Analysis	ASTM D422	ASTM Methods
Cation Exchange Capacity	EPA 9081	EPA, 1986
Surface Area	None Specified	---
Pore Volume	None Specified	---
Bulk Density	None Specified	---

Notes:

(a) Clark, F., Methods of Soil Analysis, Volume 2, pp.1460-65, "Agar-Plate Method for Total Microbial Count; Shiaris, M., and Cooney, J., Applied and Environmental Microbiology, Feb. 1983, Volume 45 no. 2, pp.706-710, "Replica Plating Method for Estimating Phenanthrene - Utilizing and Phenanthrene - Cometabolizing Microorganisms.

(b) Code of Federal Regulations, Volume 40, 1988

APPENDIX B

WDNR AND SIMON HYDRO-SEARCH FORMS

State of Wisconsin
Department of Natural Resources

Route To:
___ Solid Waste
___ Emergency Response
___ Wastewater
___ Haz. Waste
___ Underground Tanks
___ Water Resources
___ Other ______________________

SOIL BORING LOG INFORMATION
Form: 4400-122 7/91

Page ___ of ___

Facility/Project Name	License/Permit/Monitoring Number ___ ___ ___ ___ ___ ___ ___	Boring Number

Boring Drilled by (Firm name and name of crew chief)	Date Drilling Started __/__/__ M M D D Y Y	Date Drilling Completed __/__/__ M M D D Y Y	Drilling Method

DNR Facility Well No. ___ ___ ___	WI Unique Well No. ___ ___ ___ ___ ___	Common Well Name	Final Static Water Level ________ Feet MSL	Surface Elevation ________ Feet MSL	Borehole Diameter ________ inches

Boring Location State Plane ______________ N, ______________ E S/C/N _____ ¼ of ______ ¼ of Section ______ T_____N, R______ E or W	Lat ___ ___ ___ Long ___ ___ ___	Local Grid Location (if applicable) ________ Feet N or S ________ Feet E or W

County	DNR County Code _____ _____	Civil Town/City/or Village

SAMPLE									SOIL PROPERT						
NUMBER	LENGTH RECOVERED (in)	BLOW COUNTS	DEPTH (ft.)	SOIL/ROCK DESCRIPTION AND GEOLOGIC ORIGIN FOR EACH MAJOR UNIT	USCS	GRAPHIC LOG	WELL DIAGRAM	PID / FID	STANDARD PENETRATION	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	P 200	RQD/ COMMENTS

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm HYDRO-SEARCH, INC. 175 N. Corporate Dr., #100, Brookfield, WI 53045

This form is authorized by Chapters 144.147 AND 162, Wis. Stats. Completion of this report is mandatory. Penalties; Forfeit not less than $10 nor more than $5,000 for each violation. Fined not less than $10 or more than $100 or imprisoned not less than 30 days, or both, for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

Boring Number

Page ___ of ___

SAMPLE										SOIL PROPERTIES						
NUMBER	LENGTH RECOVERED (in)	BLOW COUNTS	DEPTH (ft.)	SOIL/ROCK DESCRIPTION AND GEOLOGIC ORIGIN FOR EACH MAJOR UNIT	USCS	GRAPHIC LOG	WELL DIAGRAM	PID / FID	STANDARD PENETRATION	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	P 200	RQD/ COMMENTS

Hydro-Search, Inc.

HYDROLOGISTS-GEOLOGISTS-ENGINEERS

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ ________

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 4-90

Facility/Project Name

Local Grid Location of Well
__________ ft. ☐ N. ☐ S. __________ ft. ☐ E. ☐ W.

Well Name

Facility License, Permit or Monitoring Number
_ _ _ _ _ _ _ _

Grid Origin Location
Lat. __________ Long. __________ or
St. Plane __________ ft. N, __________ ft. E.

Wis. Unique Well Number DNR Well Number

Type of Well Water Table Observation Well ☐ 11
Piezometer ☐ 12

Date Well Installed
__ __ / __ __ / __ __
m m d d y y

Distance Well Is From Waste/Source Boundary
ft.

Section Location of Waste/Source
___1/4 of ___ 1/4 of Sec. ___, T. ___ N, R. ___ ☐ E. ☐ W.

Well Installed By: (Person's Name and Firm)

Is Well A Point of Enforcement Std. Application?
☐ Yes ☐ No

Location of Well Relative to Waste/Source
u ☐ Upgradient s ☐ Sidegradient
d ☐ Downgradient n ☐ Not Known

A. Protective pipe, top elevation _ _ _ _ . _ _ ft. MSL
B. Well casing, top elevation _ _ _ _ . _ _ ft. MSL
C. Land surface elevation _ _ _ _ . _ _ ft. MSL
D. Surface seal, bottom _ _ _ _ . _ _ ft. MSL or _ _ . _ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☐ 4 1
__________ Other ☐

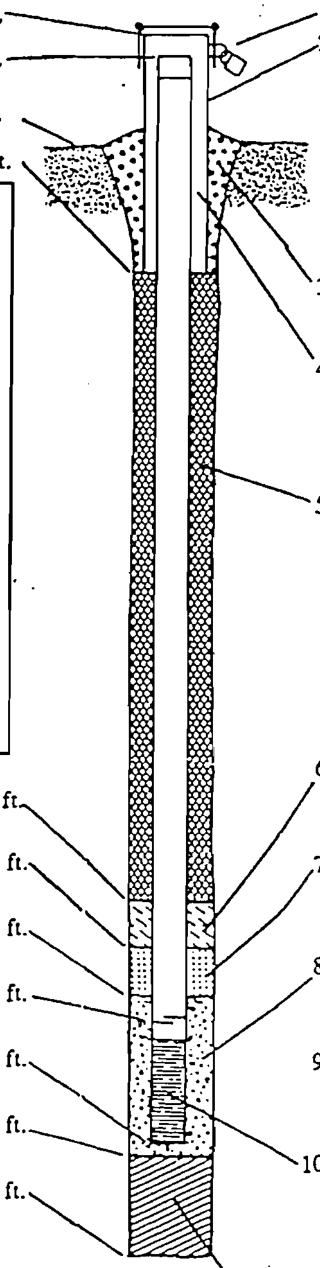
15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☐ 9 9

1(ling additives used? ☐ Yes ☐ No

Describe __________

17. Source of water (attach analysis):

____



E. Bentonite seal, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
F. Fine sand, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
G. Filter pack, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
H. Screen joint, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
. Well bottom _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
. Filter pack, bottom _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
K. Borehole, bottom _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
. Borehole, diameter _ _ . _ in.
M. O.D. well casing _ _ . _ _ in.
N. well casing _ _ . _ _ in.

1. Cap and lock? ☐ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: _ _ . _ in.
b. Length: _ _ . _ ft.
c. Material: Steel ☐ 0 4
__________ Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe: __________
3. Surface seal: Bentonite ☐ 3 0
Concrete ☐ 0 1
__________ Other ☐
4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
Annular space seal ☐
__________ Other ☐
5. Annular space seal: a. Granular Bentonite ☐ 3 3
b. ______ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ______ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 3 1
d. ______ % Bentonite . . . . . Bentonite-cement grout ☐ 5 0
e. __________ Ft ^{3} volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☐ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 3 2
c. __________ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. __________
b. Volume added __________ ft ^{3}
8. Filter pack material: Manufacturer, product name and mesh size
a. __________
b. Volume added __________ ft ^{3}
9. Well casing: Flush threaded PVC schedule 40 ☐ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
__________ Other ☐
10. Screen material: __________
a. Screen type: Factory cut ☐ 1 1
Continuous slot ☐ 0 1
__________ Other ☐
b. Manufacturer __________
c. Slot size: 0. _ _ _ in.
d. Slotted length: _ _ . _ ft.
11. Backfill material (below filter pack): None ☐ 1 4
__________ Other ☐

hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ ________

Facility/Project Name	County Name	Well Name	
Facility License, Permit or Monitoring Number _ _ _ _ _ _ _ _ _	County Code _ _	Wis. Unique Well Number _ _ _ _ _ _ _	DNR Well Number _ _ _

1. Can this well be purged dry? ☐ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☐	51
pumped slowly	☐	50
Other ________________	☐	▨

3. Time spent developing well _ _ _ _ min.

4. Depth of well (from top of well casisng) _ _ _ . _ ft.

5. Inside diameter of well _ _ . _ _ in.

6. Volume of water in filter pack and well casing _ _ _ . _ gal.

7. Volume of water removed from well _ _ _ . _ gal.

8. Volume of water added (if any) _ _ _ . _ gal.

9. Source of water added ________________________

____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. _ _ _ . _ _ ft.	_ _ _ . _ _ ft.
Date	b. _ _ / _ _ / _ _ m m d d y y	_ _ / _ _ / _ _ m m d d y y
Time	c. _ _ : _ _ ☐ a.m. ☐ p.m.	_ _ : _ _ ☐ a.m. ☐ p.m.
12. Sediment in well bottom	_ _ . _ inches	_ _ . _ inches
13. Water clarity	Clear ☐ 10 Turbid ☐ 15 (Describe)	Clear ☐ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_ _ _ _ . _ mg/l	_ _ _ _ . _ mg/l
15. COD	_ _ _ _ . _ mg/l	_ _ _ _ . _ mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm	I hereby certify that the above information is true and correct to the best of my knowledge.
Name: ________________	Signature: ________________
Firm: ________________	Print Initials: _ _ _
	Firm: ________________

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

CONTRACTOR ____________________ DATE ____________ SHIFT ____________

SITE NAME ____________________ LOCATION ____________________

BOREHOLE NUMBER(S) THIS DATE ____________________

DRILL TIME LOG: Explain all down and standby time—who authorized—unusual circumstances, etc.

CATEGORY	TOTAL HOURS	A.M.							P.M.													A.M.				
		6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
MOB/DEMOB																										
DRILLING																										
WELL CONST.																										
MOVE/DECON																										
TESTING																										
STANDBY																										
DOWN TIME																										
OTHER																										

REMARKS

EXPENDABLES: Itemize quantity, size, etc.

ITEM	QUANTITY	PART NO.

BOREHOLE	FROM	TO	FOOTAGE DRILLED	PIPE & CASING IN HOLE		BITS/CASING SHOES, ETC.				
NO.	FEET	FEET	FEET	SIZE	FEET	SIZE	NUMBER	ON	OFF	FEET

PERSONNEL TIME LOG:

POSITION	NAME	HOURS
GEOLOGIST		
DRILLER		
HELPER		

COMMENTS

LOGIST ____________________ CONSULTANT REPRESENTATIVE ____________________

DRILLER ____________________ CONTRACTOR REPRESENTATIVE ____________________

Hydro-Search, Inc.
HYDROLOGISTS·GEOLOGISTS·ENGINEERS
RENO DENVER MILWAUKEE

DAILY DRILLING SUMMARY

Site: ______________________

Project No: ______________________

Date: ______________________

Personnel: ______________________

Meter No: ______________________

Probe eV: ______________________

FIELD PID DATA FORM

Sample Number	Location	Depth (ft.)	Sample Media (1)	Moisture (2)	Time Sample Collected	Time Sample Analyzed	Volatilization Period Air Temp (C)	PID Readings (ppm)		Comments
								Background	Peak Response	

(1)
SO - Soil
SD - Sediment
GW - Ground Water
SW - Surface Water
WS - Waste (Solid)
WL - Waste (Liquid)

(2)
D - Dry
M - Moist
W - Wet
S - Saturated

SIMON HYDRO-SEARCH

WELL DEVELOPMENT/PURGE SUMMARY

Well ______

PROJECT: ______
PROJECT #: ______
LOCATION: ______
PERSONNEL: ______

WELL COORDINATES: ______
PVC RISER ELEVATION: ______
GROUND LEVEL ELEVATION: ______
CONSTRUCTED WELL DEPTH: ______
WELL CASING INSIDE DIAMETER: ______

INSTRUMENTS
TEMPERATURE: ______
CONDUCTIVITY: ______
pH METER: ______
WATER LEVEL PROBE: ______
OTHER: ______

Date	Time	Method	Water Level* (ft.msl)	Measured Well Depth* (ft.msl)	Volume Purged** (gallons)	Appearance	pH (s.u.)	T (C)	Elec. Cond. (umhos/cm)		Comments
						Color / Odor / Clarity			Measured	at 25C	

* Record both initial and final measurements when using as Well Development Summary.
** Purge four borehole volumes, if possible, prior to sampling.

WATER LEVEL AND UCT THICKNESS DATA

Project: ______________________

Project No. ______________________

Location: ______________________

Well: ______________________

Well Coordinates or Location: ______________________

Ground Surface Elevation (ft msl): ______________________

Elevation of PVC Riser (ft. msl): ______________________

Date (MM/DD/YR)	Time (Military)	Measuring Instrument	Depth to Product (ft. below top of riser)	Depth to Water (ft. below top of riser)	Depth to Product (ft. below grade)	Depth to Water (ft. below grade)	Product Thickness (ft.)	Elevation of Product Surface (ft. msl.)	Elevation of Water Surface (ft. msl.)	Measured By	Comments

8/24/92

FIELD WATER QUALITY SAMPLING AND ANALYSIS

PROJECT: ____________________
PROJECT #: ____________________
LOCATION: ____________________
PERSONNEL: ____________________

INSTRUMENTS
TEMPERATURE: ____________________
CONDUCTIVITY: ____________________
pH: ____________________
OTHER: ____________________

GENERAL:	SAMPLE POINT					
	WATER TYPE					
	DATE					
	CLOCK TIME					
DEPTH TO WATER*						
MEASURED WELL DEPTH						
PURGE VOL/CASING VOL(g)						
DEPTH SAMPLE TAKEN						
SAMPLING DEVICE						
FIELD TEMPERATURE (°C)						
ELEC. COND. (umhos/cm)	MEASURED					
	AT 25°C					
pH						
ALKALINITY						
COLOR						
ODOR						
CLARITY						
SAMPLING PARAMETERS		# OF CONTAINERS & CONT. VOLUME; CONTAINER TYPE (A=AMBER GLASS; G=GLASS; P=PLASTIC); PRESERVATIVE TYPE - (L=LAB ADDED; F=FIELD ADDED) OR NEUTRAL; FILTERED (YES OR NO)				
LABORATORY:	SENT TO: DATE SENT:					
SAMPLED BY:						

*Measured from top of well riser.

HYDRO-SEARCH, INC.
CHAIN OF CUSTODY RECORD

PROJECT NUMBER:	SAMPLERS: (Signature)

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE WATER		NO. OF CONTAINERS	ANALYSIS REQUIRED
				Comp.	Grab		

elinquished by: (Signature)	Received by: (Signature)	Date/Time
elinquished by: (Signature)	Received by: (Signature)	Date/Time
elinquished by: (Signature)	Received by: (Signature)	Date/Time
elinquished by: (Signature)	Received by Mobile Laboratory for Field Analysis: (Signature)	Date/Time

Is ied by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time

ethod of Shipment:

Project No.:

Project Name:

Sample No.

Date/Time: __/__/__ ___:___ a.m. p.m.

Lab No.

Grab ☐ Composite ☐

Preservation: Neutral ☐; HNO_3 pH < 2 ☐

H_2SO_4 pH < 2 ☐; NaOH pH > 12 ☐; Other ☐

____

SAMPLE LABEL

Instrument Number ____________________

Date	User	Calibration Gas (Cannister Pressure)	Probe eV	Span	Reading (ppm)

HNu CALIBRATION LOG

APPENDIX C

SITE HEALTH AND SAFETY PLAN
AND
STANDARD FIELD SAFETY PRACTICES

HEALTH AND SAFETY - GENERAL

1.0 Introduction

The objective of this section is to provide safety guidance and procedures for WPSC's environmental investigation of the Sheboygan manufactured gas plant (MGP) site by the Simon Hydro-Search project team. This section contains a discussion of the medical surveillance and emergency medical support, describes the information to be conveyed at the on-site briefing, and briefly discusses health and safety procedures, protection/detection equipment, and emergency procedures. Additional information on the last three topics is provided in the attached site safety plan.

Mr. Steve Carlson, Simon Hydro-Search's Health and Safety Director, is responsible for the development and implementation of the safety program for this project. The Site Safety Officer is the on-site person responsible for ensuring that this plan is implemented on a day-to-day basis.

2.0 Medical Surveillance

All site personnel will be part of a medical surveillance project that will ensure that they are medically fit to perform hazardous site operations. The project meets the requirements of the OSHA regulations for hazardous waste operations, 29 CFR 1910.120. A physician will review each worker's medical and occupational history and conduct a medical examination. The physician shall provide a written opinion of the suitability of each worker to work on hazardous waste operations. These records will be maintained by the Simon Hydro-Search project team firms.

Examinations will occur:

- At least once every twelve months.

- At termination of employment.

- As requested by the physician or after notification by the employee that the employee has developed symptoms of an exposure to hazardous substances.

Subcontractors will be required to provide a physician's fit for duty statement for each site worker to the Simon Hydro-Search Health and Safety Director.

3.0 Health and Safety Training

3.1 Off-Site Instruction

All personnel working on the site who have the potential for exposure to hazardous substances will receive formal health and safety training. This training meets the requirements of 29 CFR 1910.120. Training for Simon Hydro-Search personnel is conducted in-house by a certified industrial hygienist and includes classroom instructions, demonstrations, hands-on use of protective gear, respirator use and fit testing. Subcontractors will be required to provide training certificates to Simon Hydro-Search for each site worker.

3.2 FIT Testing Requirements

All personnel (including visitors) entering the exclusion zone or decontamination zone using a negative pressure respirator must have successfully passed a qualitative respirator FIT test in accordance with OSHA 29 CFR 1910.134 within the last 12 months. Documentation of FIT testing is the responsibility of each employer.

3.3 On-Site Briefing

An on-site safety briefing will be given by the Site Safety Officer to all personnel on their first day at the site. The on-site briefing serves to identify site specific hazards and procedures for handling emergency incidents. The briefings will be repeated periodically or as needed to discuss hazards as they are encountered during the course of the project.

The topics to be discussed in the initial on-site briefing are:

- Site history
- Physical hazards
- Chemical hazards
- Animal bites, stings and poisonous plants
- Site control
- Heavy equipment use
- Excavation and trenching
- Use of tools
- Overhead and underground utilities
- Personnel protective equipment
- Respiratory protection
- Monitoring
- Decontamination
- Procedures for handling site emergencies

4.0 Site Control

4.1 Work Zones

In order to prevent the transportation of contaminants off-site and to minimize the exposures to on-site personnel, site control measures need to be implemented. The two primary control measures are definition of work zones and decontamination procedures. The following discussion defines the different work zones in general and describes their purpose.

- Exclusion Zone (EZ) - The area known or suspected of being contaminated.

- Contamination Reduction Zone (CRZ) - the area where personnel and equipment exiting the EZ are decontaminated. The CRZ will be provided with facilities and solutions for decontaminating personnel and hand-held equipment. The adjacent equipment CRZ sub-zone will be used for decontamination of heavy equipment.

- Support Zone (SZ) - a clean area used to store equipment, vehicles, etc.

Given the nature and size of the site, there will be many locations on-site which will require delineated work zones. For tasks which will take place at specific locations on-site, i.e., well installation, soils borings, work zones will be established (Exclusion Zone, CRZ, Support) and decontamination procedures will be localized at each site. For tasks which will require a series of locations, (i.e., surface soil sampling, off-site sampling) work zones and decontamination procedures will be centralized at the support area on-site.

4.2 Site Access

Site access will be limited to authorized personnel. As appropriate, designated entry and emergency exits will be indicated on a site map attached to the site specific health and safety plan.

5.0 Task Health and Safety Risk Analysis

This section discusses general safety practices for activities at MGP sites. Each of the following subsections briefly discusses hazards and protective practices for the various tasks that may be performed on the site. Additional detailed information is provided in the attached Health and Safety Plan. Also included in the attachment are operating practices for activities such as working with heavy equipment and drilling.

5.1 Drilling and Soil Sampling

Soil borings and soil gas probes will be installed at the site. The principal hazards associated with these activities are injury from heavy equipment, contact with underground or overhead utilities, and contact with subsurface contaminants. Operating practices for drilling are included in the attachment.

During drilling and soil gas probe installation, an HNu PID, combustible gas indicator and hydrogen cyanide Monitox will be used to frequently monitor the breathing space for chemical hazards or explosive conditions. The level of personal protective equipment will be "D" unless monitoring indicates the need to elevate the safety level to "C". Action levels are detailed in the attached Health and Safety Plan.

5.2 Ground-Water Sampling

Ground-water sampling will be done at each site. The principal hazards associated with this activity are heat-stress and chemical contamination. An operating practice for heat stress is included in the attached Health and Safety Plan. An HNu will be used to monitor the well head space when a well cap is initially removed. The level of protection will initially be "C". If the HNu readings indicate that the chemical contamination level in the breathing zone is below the action level, than Level "D" can be used.

5.3 Decontamination Procedures

Decontamination is required for all field activities. The principal hazards associated with this activity are heat stress and chemical contamination. An operating practice on heat stress is provided with the attached Health and Safety Plan. Personnel performing decontamination will wear Level "D" protection. In addition, a splash shield will protect the face whenever deemed appropriate.

5.4 Air Monitoring

Frequent air monitoring will be conducted during soil gas probe installation, drilling, monitor well installations, well development, hydraulic testing, and ground-water sampling. An HNu, hydrogen cyanide Monitox meter, and a combustible gas indicator will be used during drilling and soil gas probe installation. Assuming no combustible gases or cyanide are detected during drilling, only the HNu will be used to monitor the breathing space during the other site activities. All readings and calibration data will be recorded in a field notebook.

6.0 Protection/Detection Equipment and Procedures

A description of personal protective clothing and equipment required at each site is contained in the attached Health and Safety Plan.

Because of the danger of hitting underground utilities, the State of Wisconsin's Diggers Hotline (1-800-242-8511) will be contacted before any digging is done on a site.

6.1 Emergency Procedures

6.2 General

A phone will be provided on-site for emergency contact with the hospital or fire department in case of an incident or accident. A list of emergency phone numbers and a map to the hospital is provided in the attached Health and Safety Plan. Site emergency procedures and routes of evacuation are also discussed in the Health and Safety Plan.

All accidents or incidents will be reported to the Simon Hydro-Search Health and Safety Director immediately by phone contact. This will be followed up by a written report within 5 days.

6.3 Medical On-Site

In addition to arrangements for off-site medical services, each work site will have at least one person on-site during working hours who has current Red Cross certification in first-aid and CPR. All Simon Hydro-Search personnel are first aid and CPR certified in accordance with the Simon Hydro-Search corporate health and safety plan. Portable first-aid kits will be available on all sites.

ENVIRONMENTAL INVESTIGATION OF MGP SITES

PROGRAM SITE HEALTH AND SAFETY PLAN (HASP)

I. General Information

A. Project Identification

1. Site Name: Sheboygan MGP Site 2. Client: WPSC

3. Work location address: 732 N. Water Street

Sheboygan Wisconsin

CITY STATE ZIP

B. Scope of Work

1. Describe briefly: Site characterization of soil, and ground water.

. Review and Approval Documentation

1. Reviewed by: (a) PM. ____ Date: ____

(b) PD. ____ Date: ____

2. Approved by: ____ Date: ____

CORPORATE HEALTH AND SAFETY DIRECTOR (CHSD)

D. Site Characteristics

FACILITY DESCRIPTION (attach map/sketch)

See Figure 3-2 attached

Former manufactured gas plant site. No surficial evidence of former MGP operations remains. The site is currently gravel covered and has been developed into a boat docking and RV camping area.

SITE ACCESS AND SECURITY:

No site access problems.

UNUSUAL FEATURES (accessibility, power lines, terrain, etc.):

Underground utilities present.

STATUS (active, inactive, unknown): Inactive

SUSPECTED NATURE OF CONTAMINATION: (sources, impacted areas, migration, dispersion pathways)

Potential for polynuclear aromatic hydrocarbons and cyanide compounds in surface and subsurface soils. Other commonly found chemical hazards listed in Section C of this form.

II. Health and Safety Evaluation

A. Health and Safety Evaluation

1. Activities covered under this plan.

No.	Task/Sub-Task	Description
01	N	Surface Water and River Sediment
02	N	Surface Soils Sampling
03	N	Test Pit/Trenches
04	Y	Soil Boring
05	Y	Monitoring Well Installation
06	Y	Groundwater Sampling
07	N	Geophysical Exploration

2. Types of Hazards: (Place a Y/N in each bracket to indicate presence/absence of hazard).

(a) PhysioChemical (Y) Flamm. (Y) Explo. (N) Corro. (Y) React. (N) O_2 Rich
(N) O_2 Deficient

Chemically Toxic (Y) Inhal. (Y) Ingest. (Y) Cont. (N) Absorb. (Y) Carcin.
(N) Mutagen (N) Terat.
(N) OSHA 1910.1000 Substance
(N) OSHA Specific Hazard. Sub. Standard, Describe: ____________

(b) Biological: (N) Etiol. Agent (N) Other - plant, insect, animal

(c) Radiation: Ionizing: (N) Internal Exposure (N) External Exposure

Non-Ionizing: (N) UV (N) IR (N) RF (N) MicroW
(N) Laser

(d) Physical Hazards (Y)

(e) Construction Activities (Y)

B. <u>Source/Location of Contaminants and Hazardous Substances</u>

1. Directly Related Tasks

(X) Air Dust
( ) Other Surface ____________
(X) Ground Water ____________
(X) Soil ____________
( ) Surface Water ____________
( ) Other ____________

2. Indirectly related to work - nearby process(s) which could affect team members:

( ) Client Facility
( ) Client Briefing Arranged
( ) Nearby Non-Client Facility

3. Hazard Level: ( ) Unknown ( ) A ( ) B (X) C (X) D

Justification: Anticipate low levels of contamination, will be air monitoring breathing space.

C. Chemical Hazards

COMMONLY FOUND CHEMICAL HAZARD

EXPOSURE GUIDELINES/SYMPTOMS OF EXPOSURE

Contaminant	PEL/TLV ppm or mg/m^3 (specify)	IDLH ppm or mg/m^3 (specify)	Symptoms/Effects of Acute Exposure	Photo Ionization Potential
Benzene	1 ppm	3,000 ppm	Irritation to Eyes, Nose, Throat, Headache, Drowsiness	9.24
Coal Tar Pitch Volatiles	0.2 mg/m^3	400 mg/m^3	Dermatitis, Bronchitis, Carcinogen	
Naphthalene	10 ppm	500 ppm	Irritating to Eye, Nausea, Vomiting	8.1
2-Methylnaphthalene				7.9
Acenaphthylene				
Acenaphthene				
Fluorene				8.6
Phenanthrene		400 mg/m^3		7.8
Fluoranthene				
Pyrene		400 mg/m^3		7.7
Benzo(a)-Anthracene				
Benzo(k)-Fluoranthane				
Benzo(a)-Pyrene		400 mg/m^3		
Toluene	100 ppm	2,000 ppm	Weak, Dizzy, Dilated Pupils	8.8
Ethylbenzene	100 ppm	2,000 ppm	Irritating to Eye and Mucus Membranes, Dermatitis	8.8
Styrene	50 ppm	5,000 ppm	Irritating to Eyes, Nose; Drowsy, Weakness	8.5
Xylenes	100 ppm	10,000 ppm	Dizziness, Irritation, Drowsiness, Nausea	8.6
Cyanide(s)	5 mg/m^3	50 mg/m^3	Headache, Nausea, Weak, Asphyxiation, Death	
PCBs	0.5 mg/m^3	NE	Irritating, Dermatitis, Suspect Carcinogen	

NE = None Established

III. Personnel Protection Plan

A. Levels of Protection

Task	Activity	Level of Protection Initial	Upgrade
1.	Drilling/Monitor Well Installation	NA	NA
2.	Gas Probe Installation	D	C
3.	Well Development/Hydraulic Testing/Sampling	D	C

B. Action Levels

*	Explosive	<10%	LEL	Continue investigation.
	Atmosphere	10-25%	LEL	Continue on-site monitoring, proceed with caution.
		>25%	LEL	Explosion hazard, withdraw from area immediately.
*	Oxygen	<19.5%		Exit area.
		19.5-25%		Continue investigation and monitoring.
		>25%		Discontinue work, fire hazard potential.
*	Organics**	0-2 ppm		Level D
	(OVA,HNu)	2-5 ppm		Level C
		>5 ppm		Discontinue work and evaluate.
*	HCN	0-1 ppm		Level D
		>1 ppm		Exit site.

**Concentration above background - background values will be established upwind before start of work.

C. Personal Protective Equipment

For tasks requiring Level "C" protection:

- Full face air-purifying respirator
- Chemical protective suit (e.g., saranex coated TYVEK)
- Gloves, inner (surgical type)
- Gloves, outer (PVC)
- Boots, steel toe
- Boot covers (latex)
- Hard hat (with splash shield optional)

III. Personnel Protection Plan (cont'd.)

For tasks requiring Level "D" protection:

- Chemical protective suit
- Gloves (chemical resistant)
- Boots/shoes (safety)
- Boot covers
- Hard hat
- Safety Glasses

D. Air Monitoring Equipment

Instrument	Detects	Frequency	Calibration*
Hnu Photoionization Detector (PID)	Organics	Take frequent measurements during all intrusive operations	Daily
Combustible Gas Indicator	Explosive levels, oxygen level	During pit/trench excavation	Daily
Hydrogen Cyanide Monitor	Hydrogen cyanide gas	Continuously during pit/trench excavation, soil borings, well installation	Daily

*Instructions for calibration are maintained in equipment storage cases.

IV. Decontamination Plan

1. Personnel Decontamination

Section III C lists the tasks and specific levels of protection required for each. Consistent with the levels of protection required, step by step procedures for personnel decontamination for each level of protection are attached.

IV. Decontamination Plan (cont'd.)

2. Levels of Protection Required for Decontamination Personnel

The levels of protection required for personnel assisting with decontamination will be:

(__ Level B, __ Level C _X_ Level D)

(CHECK) Modifications include:

Decontamination will be same level as that called for in the activity.

3. Disposition of Decontamination Wastes

(Provide a description of waste disposition including identification of storage area, hauler, and final disposal site if applicable.)

Decontaminated waste will be containerized.

4. Equipment Decontamination

A procedure for decontamination steps required for non-sampling equipment and heavy machinery follows:

Equipment will be steam-cleaned in the Exclusion Zone.

5. Sampling Equipment Decontamination

Sampling equipment will be decontaminated in accordance with the following procedure:

Equipment will be rinsed in a trisodium phosphate/water solution followed by triple rinsing with deionized water.

Level D/Modified Level D Decontamination

(Check indicated functions or add steps as necessary)

Step	Function	Description of Process, Solution and Container
(X)	Segregated equipment drop	
( )	Boot cover and glove wash	
( )	Boot cover and glove rinse	
(X)	Tape removal - outer glove and boot	Place in waste container.
(X)	Boot cover removal	Place in waste container.
(X)	Outer glove removal	Place in waste container.

========================HOT LINE========================

Step	Function	Description of Process, Solution and Container
( )	Suit/safety boot wash	
( )	Suit/boot/glove rinse	
( )	Safety boot removal	
(X)	Suit removal	Place in waste container.
( )	Inner glove wash	
( )	Inner glove rinse	
X)	Inner glove removal	Place in waste container.

==================CRC/SAFE ZONE BOUNDARY====================

Step	Function	Description of Process, Solution and Container
( )	Field wash	
( )	Redress	

Disposal Plan:

End of Day: **Close and store container for eventual disposal.**

Level C Decontamination

(Check indicated functions or add steps as necessary)

Step	Function	Description of Process, Solution and Container
(X)	Segregated equipment drop	
( )	Boot cover and glove wash	
( )	Boot cover and glove rinse	
(X)	Tape removal - outer glove and boot	Place in waste container.
(X)	Boot cover removal	Place in waste container.
(X)	Outer glove removal	Place in waste container.

========================HOT LINE========================

( )	Suit/safety boot wash	
( )	Suit/boot/glove rinse	
( )	Safety boot removal	
(X)	Suit removal	Place in waste container.
( )	Inner glove wash	
( )	Inner glove rinse	
X)	Face piece removal	Clean and store
(X)	Inner glove removal	Place in waste container.
( )	Inner clothing removal	

==================CRC/SAFE ZONE BOUNDARY===================

( )	Field wash	
( )	Redress	

Disposal Plan:

End of Day: **Close and store container for eventual disposal.**

End of Project: **Determine proper method of disposal of drum based on results of sampling.**

V. Contingencies (to be completed for each site)

A. Emergency Contacts and Phone Numbers

Local Medical Emergency Facility	Memorial Medical Center 2629 N. 7th Street	459-8300
Simon Hydro-Search Health and Safety	175 N. Corporate Drive	792-1282
Fire Department		911
Police Department		911
On-Site Coordinator		--
Site Telephone	N.A. - Car Phone	
Nearest Telephone	Car Phone (Location)	

B. Local Medical Emergency Facility(ies)

Primary

Name of Hospital: Memorial Medical Center

Address: 2629 N. 7th Street Phone No.: 911 or 457-5033

Name of Contact: Joanne Kaehne Phone No.: ______

Type of Service: ( ) Physical trauma only ( ) Chemical exposure only
(X) Physical trauma/chemical exposure (X) Open 24 hours

Route to Hospital: (attach map) From Site, Take Center Street East to 7th Street (two blocks). 7th Street North (left) approximately 1 mile to hospital (on right).

Travel time from site (minutes): 5 minutes

Distance to hospital (miles): 1.25 miles

Name of 24-hour ambulance service: ______
Phone No.: 911

V. Contingencies (to be completed for each site) (cont'd.)

C. Response Plans

Emergency Signal: Sound car horn frequently

1. Medical - General: **Injuries will receive immediate medical care.**
   - (a) First aid kit: Type: **Mobile**
     Location: **Site Vehicle**
   - (b) Eyewash required: (Y) Y/N
   - (c) Safety shower: Location: **None**
2. Special first aid procedures hydrofluoric on-site: (N) Y/N
   (Attach HF procedure and ensure solution is on-site)
3. Cyanides on-site: (Y) Y/N
   (Confirm that Local Medical Emergency Facility has antidote kit)
4. Fire extinguisher: Type: **ABC**
   Location: **Site Vehicle**
5. Plan for response to spill/release: **Not anticipated to occur.**
6. Spill response gear: Description: **None**
   Location:
7. Plan for response to security problems: **Vehicles will be locked at night.**

D. Specific Responses

Fire:

Stop work, shut off equipment, and evacuate to safe distance (Simon Hydro-Search's vehicle should be kept at a reasonable distance from work area to prevent endangerment from fire). Contact fire department, then Simon Hydro-Search. Keep at a safe distance until emergency services arrive. No fire fighting beyond incipient fires will be attempted!

D. Specific Responses (cont'd.)

Injury/Illness:

Perform first aid, if possible, and call EMS. Do not move if broken bones are suspected unless life is endangered. If person is safe to move (minor cuts, burns, etc.), transport person to hospital. If serious, arrange for rescue squad.

Over-exposure:

Remove employee (only if there is no danger to rescue) from exposure source to location of fresh air. Contact rescue squad/ambulance as necessary. Do not continue work until source of contamination is found, identified, and controlled. Contact Simon Hydro-Search office for technical assistance.

Hazardous Materials Accident:

Stop equipment and work. Relocate to safe distance. To the extent possible, determine nature of incident (utility, gas, pipe, etc.). Contact Simon Hydro-Search offices for instructions. Do not attempt equipment backout from utility strike without guidance of utility company.

ALL EMERGENCIES MUST BE REPORTED TO OFFICE

NOTE: **ALL EMERGENCY SITUATIONS REQUIRE A FOLLOW-UP ACCIDENT/NEAR-MISS INVESTIGATION REPORT**

VI. Site Personnel and Certification Status

NAME	TITLE	TASK(S)	MEDICAL CURRENT (c)	FIT TEST CURRENT		TRAINING CURRENT (a)
				QUALITY (b)	QUANTITY (b)	
			X	X	X	X
	Site Safety Officer		X	X	X	X

(a) Training

All personnel, including visitors, entering the exclusion or contamination reduction zones must have certifications of completion of training in accordance with OSHA 29 CFR 1910.29, CFR 1926/1910 or 29 CFR 1910.120.

(b) Respirator Fit Testing

All persons, including visitors, entering any area requiring the use or potential use of any negative pressure respirator must have had as a minimum, a qualitative fit test, administered in accordance with OSHA 29 CFR 1910.134 or ANSI within the last 12 months. If site respirator for protection from asbestos or lead, employees must have had a quantitative fit test, administered according to OSHA 29 CFR 1910.1002 or 1025 within the last six months.

(c) Medical Monitoring Requirements

All personnel, including visitors, entering the exclusion or contamination zones must be certified as medically CFR 1910, 29 CFR 1926/1910 or 29 CFR 1910.120.

The Site Safety Officer is responsible for verifying all certifications and fit tests.

VII. Health and Safety Plan Approval/Sign-Off Format

I have read, understood, and agreed with the information set forth in this Health and Safety Plan (and attachments) and discussed in the Personnel Health and Safety briefing.

NAME	SIGNATURE	DATE
NAME	SIGNATURE	DATE
NAME	SIGNATURE	DATE
NAME	SIGNATURE	DATE
NAME	SIGNATURE	DATE
SITE SAFETY OFFICER	SIGNATURE	DATE

SIMON HYDRO-SEARCH

STANDARD SAFETY

PROCEDURES DURING DRILLING

1) Hard hat, safety glasses or goggles, shirt and full length pants and work shoes/boots are required for all personnel working with or near the rig.

2) No eating, drinking or smoking is allowed near the rig if site has known of suspected contamination of soils or ground water.

3) Direct contact with contaminated or suspected contaminated surfaces should be avoided.

4) Tools, materials, cords, hoses or debris should be located so as not to cause tripping or to come into contact with moving rig parts.

5) Tools, materials and equipment subject to displacement or falling must be adequately secured.

6) Flammable materials must be stored free of ignition sources. Flammable liquids must be stored in an approved container.

7) All underground utility locations must be identified prior to drilling.

8) Maintain adequate clearance of drill from overhead transmission lines. Minimum clearance is 25 feet unless special permission is granted by utility company. Call local utility company for proper clearance.

9) Loose and frayed clothing, loose long hair, loose jewelry, rings or chains may not be worn while working with rotating equipment.

10) Machinery must be shut down prior to repairs or lubrication (except parts that must be in motion for lubrication).

11) Mechanical equipment must be shut down prior to and during fueling operations.

12) Appropriate respiratory and personal protective equipment must be work when conditions warrant their use.

OPERATING PRACTICE 1

UTILITIES

Prior to beginning work on site or in or around facilities, or buildings or other structures which could be served by or connected to utilities, a search must be conducted by the SHSC, ideally in association with someone familiar with the facility to identify any overhead, underground and in-workplace utilities such as electrical lines and appliances, gas lines, pipelines, steam lines, water lines, sewer lines, pressured air lines. The location of any utility which could pose a risk to workers must be communicated to all workers during site safety indoctrination. Utilities should be marked or access other restricted to avoid chance of accidental contact.

Utilities shall be considered "live" or active until a reliable source has documented them to be otherwise.

A. Overhead Utilities

1.0 Operations Adjacent To Overhead Power Lines

- Overhead transmission and distribution lines will be carried on towers and poles which provide safe clearance over roadways and structures.
- Clearances will be adequate for the movement of vehicles and for the operation of construction equipment.

Overhead or above ground electric lines shall be considered "live" or active until a reliable source has documented them to be otherwise.

No work place including, elevated work platforms, ladders, scaffolding, man lifts or vehicle superstructures shall be erected within 20 feet of overhead electrical lines until the line is de-energized, grounded or shielded and an electrician has certified that arcing can not occur between the work place or superstructure.

2.0 Other Overhead or In-Workplace Utilities

Workers must be instructed to use care in working under or around utilities to avoid hot surfaces, loud noises, pressured gases or air, leaking of pipelines, discharge of steam or hot liquids and must work to prevent accidental contact with or breakage.

B. Underground Utility Searches

No excavating, drilling, or boring shall be done until a thorough underground utility survey, conducted by knowledgeable persons or agencies has been made and it is found safe to begin. Even when a search is completed, drilling, boring and excavation should commence carefully until past the depth at which such utilities are usually located.

B. Underground Utility Searches (cont'd.)

All underground utilities shall be considered "live" or active until reliable sources demonstrate otherwise.

The SHSC is responsible for ensuring underground utility searches are performed and procedures are conformed with.

OPERATING PRACTICE 2

HEAT STRESS PREVENTION AND MONITORING

Heat stress may occur at any time work is being performed at elevated temperatures. Wearing of chemical protective clothing, which may result in decreasing natural body ventilation, increases the risk of heat stress.

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur, ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to fatal. Because heat stress is one of the most common and potentially serious illnesses at hazardous waste sites, regular monitoring and other preventative measures are vital.

Site workers must learn to recognize and treat the various forms of heat stress. The best approach is preventative heat stress management. In general:

- Have workers drink 16 ounces of water before beginning work, such as in the morning or after lunch. Provide disposable four-ounce cups, and water that is maintained at 50-60°F. Urge workers to drink one to two of these cups of water every 20 minutes for a total of 1 to two gallons per day. Provide a cool area for rest breaks. Discourage the intake of coffee during working hours. Monitor for signs of heat stress.

- Acclimate workers to site work conditions by slowly increasing workloads, i.e., do not begin site work activities with extremely demanding activities.

- Provide cooling devices to aid natural body ventilation. These devices, however, add weight and their use should be balanced against worker efficiency. An example of a cooling aid is long cotton underwear which acts as a wick to absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.

- In extremely hot weather, conduct field activities in the early morning and evening.

- Ensure that adequate shelter is available to protect personnel against heat as well as cold, rain, snow, etc. which can decrease physical efficiency and increase the probability of both heat and cold stress. If possible, set up the command post in the shade.

- In hot weather, rotate shifts of workers wearing impervious clothing.

- Good hygienic standards must be maintained by frequent changes of clothing and showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

The following is a discussion of specific results of heat stress:

OPERATING PRACTICE 2

HEAT STRESS PREVENTION AND MONITORING (CONT'D.)

1.0 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of heat regulating mechanisms of the body; the individual's temperature control system that causes sweating stops working correctly. Body temperature rises so high that brain damage and death will result if the person is not cooled quickly.

- Symptoms - Red, hot, dry skin, although person may have been sweating earlier; nausea; dizziness; confusion; extremely high body temperature; rapid respiratory and pulse rate; unconsciousness or coma.

- Treatment - Cool the victim quickly. If the body temperature is not brought down fast, permanent brain damage or death will result. Soak the victim in cool, but not cold water; sponge the body with cool water or pour water on the body to reduce the temperature to a safe level (102°F). Observe the victim and obtain medical help. Do not give coffee, tea, or alcoholic beverages.

0 Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. The condition is much less dangerous than heat stroke, but it nonetheless must be treated.

- Symptoms - Pale, clammy, moist skin; profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, breathing is shallow. The person may have a headache, may vomit, and may be dizzy.

- Treatment - Remove the person to a cool, air conditioned place, loosen clothing, place in a head-low position and provide bed rest. Consult physician, especially in severe cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have patient drink one to two cups of water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be about one to two gallons per day.

3.0 Heat Cramps

Heat cramps are caused by perspiration that is not balanced by adequate fluid intake. Heat cramps are often the first sign of a condition that can lead to heat stroke.

- Symptoms - Acute painful spasms of voluntary muscles, e.g., abdomen and extremities.
- Treatment - Remove victim to a cool area and loosen clothing. Have patient drink one to two cups of water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be one to two gallons per day.

4.0 Heat Rash

Heat Rash is caused by continuous exposure to heat and humid air and aggravated chafing clothes. The condition decreases ability to tolerate heat.

- Symptoms - Mild red rash, especially in areas of the body that come into contact with protective gear.
- Treatment - Decrease amount of time in protective gear and provide powder to help absorb moisture and decrease chafing.

5.0 Heat Stress Monitoring and Work Cycle Management

For strenuous field activities that are part of on-going site work activities in hot weather, the following procedures shall be used to monitor the body's physiological response to heat, and to manage the work cycle, even if workers are not wearing impervious clothing. These procedures are to be instituted when the temperature exceeds 70°F.

- Measure Heart Rate - Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beat/minute at the beginning of the next rest period, the following work cycle should be further shortened by 33%. The procedure is continued until the rate is maintained below 110 beats/minute.

5.0 Heat Stress Monitoring and Work Cycle Management (cont'd.)

- * Measure Body Temperature - When ambient temperatures over 90°, body temperatures should be measured with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should be shortened by 33%, while the length of the rest period stays the same. If the OT exceeds 99.6°F at the beginning of the next rest period, the following work cycle should be further shortened by 33%. The procedure is continued until the body temperature is maintained below 99.6°F.

- * Physiological Monitoring Schedule - The following Suggested Frequency of Physiological Monitoring Schedule for Fit and Acclimated Workers shall be used as a guideline:

Temperature	(Level D)	(Level C)
90° (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-32.2°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

Measure the air temperature with a standard thermometer. Estimate fraction of sunshine by judging what percent the sun is out.

100% sunshine = no cloud cover = 1.0
50% sunshine = 50% cloud cover = 0.5
0% sunshine = full cloud cover = 0.0

Adjusted Temperature = Actual Temperature + 13 X (% Sunshine Factor)

The length of work period is governed by Frequency of Physiological Monitoring. The length of the rest period is governed by physiological parameters (heart rate and oral temperature). For example, if an individual's heart rate exceeds 110 beats/minute at the beginning of the rest period, that individual will remain on rest-time until his/her heart rate drops well below 110 beats/minute and their next work period (= duration of time before suggested physiological monitoring) is decreased by 33%.

OPERATING PRACTICE 3

APR INSPECTION AND CHECKOUT

1. Inspect the entire unit for any obvious damages, defects, or deteriorated rubber.

2. Make sure that the facepiece harness is pliable, that fasteners work easily and there is no sign damage, drying or other potential cause of harness failure.

3. Inspect lens for damage, diminishment of visibility and proper seal in facepiece and that a removable protective lens cover is in place.

4. Exhalation Valve(s) - remove cover(s) and check valve for debris or residue (which could cause sticking) or for tears in the valve (which could cause leakage).

5. Inhalation Valves - in the MSA full face respirators, the inhalation valves are in pockets and are difficult to examine. They can be inspected by screwing off the cartridges and looking through the opening from the cartridge holder and feeling inside the pocket. The inhalation valves in the MSA PAPR and MSA gas mask facepieces are located in the speaking diaphragm housing and are accessed by unscrewing the breathing hose fitting from the facepiece (which may require a tool). Once located, make sure the valves are seated properly and free of tears, debris and residue.

   In some dual cartridge respirators, the valves are accessible and plainly visible inside the facepiece. Make sure the valves are seated properly and free of tears, debris and residue.

6. Gaskets/"O" Rings - inspect the cartridge receptacle of the MSA dual cartridge respirator and any respirator using similar cartridge holders to ensure an appropriate gasket is in place to ensure a good seal. Inspect the gasket to be sure it is not dried out,cracked or torn and that it is seated properly. Inspect gaskets in the breathing hose fittings of gas masks and PAPRs to ensure thy are in place and not torn, cracked, dried out or improperly seated.

7. Makes sure the speaking diaphragm retainer ring is tight.

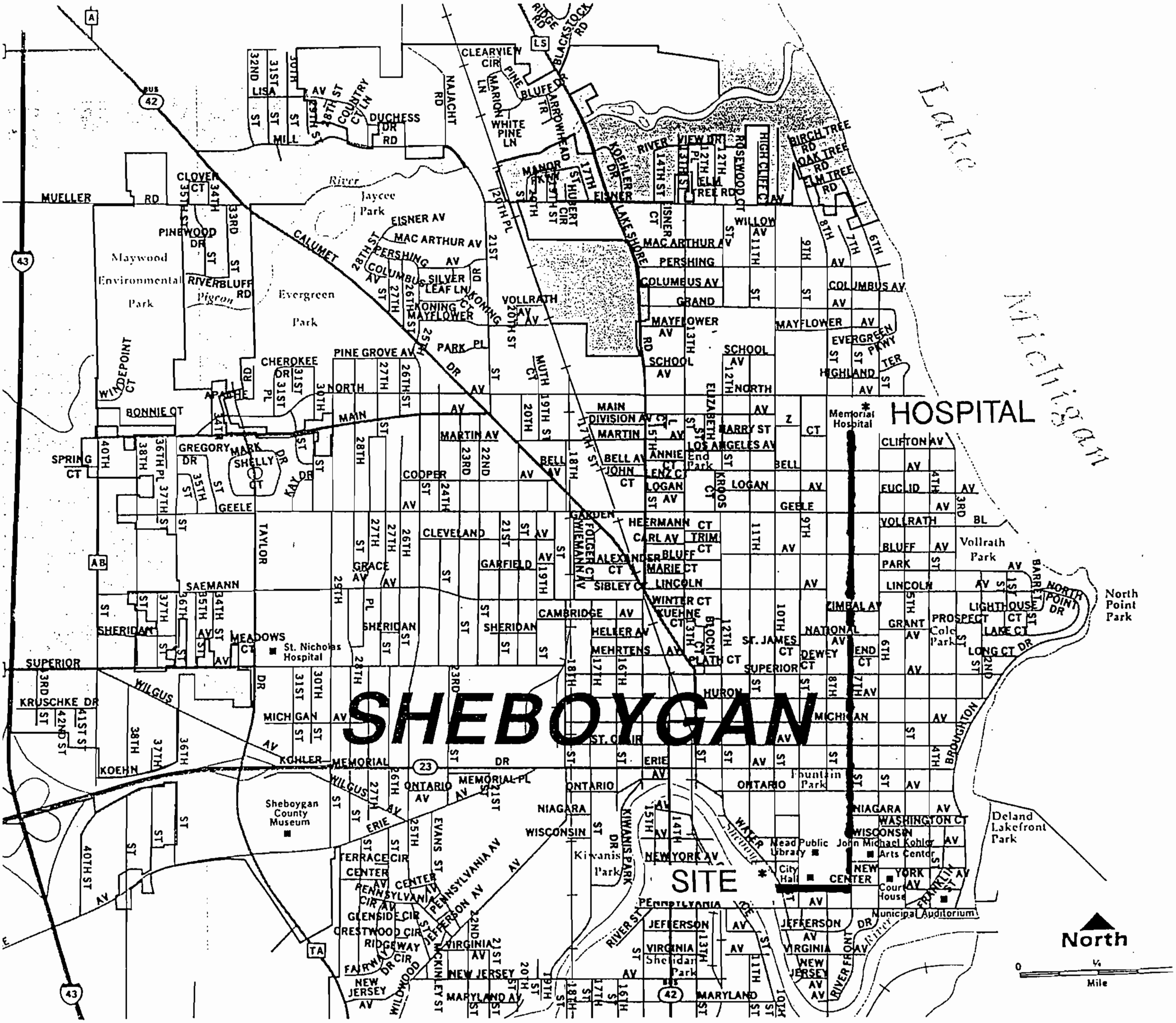
8. Make sure the correct cartridge or canister is attached.

9. Don and perform positive then negative pressure test by:

   a. Covering exhalation valve and gently blowing out, the mask should push away from the face evenly;

   b. Cover inhalation ports of cartridge or canister or the end of breathing hose and inhale, a vacuum should form and draw facepiece in toward the face.

10. Inspect breathing hoses of MSA PAPR's and gas masks by stretching the hose out and observing for cuts, drying or cracking. Cover both ends of the breathing tube and stretch, this should cause hose to deflate if there are no pin holes.



ROUTE TO HOSPITAL

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